ARCHIVES OF OPHTHALMOLOGY.

ON PARALYSIS OF THE ASSOCIATED LATERAL MOVEMENTS OF THE EYES WITH PRESERVATION OF THE POWER OF CONVERGENCE.

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OUR knowledge of the anatomy and physiology of the nuclei which govern the muscles of the eyes, and especially of their connections with each other and with their nerve trunks, is not yet complete enough to enable us, in all nuclear disturbances of the ocular movements, accurately to determine the seat, degree, and nature of the lesion. This applies with especial force to lesions of the pons with derangements of the associated lateral movements of the eyes. We can, therefore, to-day justly repeat, though with some limitations, the statement made by Mierzejewsky and Rosenbach[1] in 1885, that the question concerning "the mechanism of the combination of paralysis of the external rectus of one side with that of the internal rectus of the other side in unilateral lesions of the sixth nucleus" is still an open one, although many a publication that has appeared since then has brought us nearer to its solution. The difficulty of solving this problem lies in the fact that paralyses of the kind mentioned above are seldom observed *uncomplicated* by other symptoms, and even more seldom reach the autopsy table in their uncomplicated condition. For this reason the following case, which was carefully observed at the Cologne Charitable Eye-Clinic, seems to me fit for publication, and of a kind suitable to throw additional light upon this field.

Caspar Frederic K., seventy-one years of age, agent, entered the clinic for the first time on January 16, 1897. He claims never to have had a severe disease. Toward the close of the forties he suffered from attacks of vertigo, especially after violent exertion; since then these attacks have been rare. Denies having had syphilis, nor are objective symptoms to be found. Indulgence in alcohol and tobacco always moderate. Last winter, as well as this, frequent coughing but no expectoration or spitting of blood. Examination of lungs shows only marked emphysema, no tuberculosis. Apex-beat in sixth intercostal space, 1 *cm*, within mammary line. Marked retraction of epigastric region during systole. At the first examination a systolic murmur could be heard over the apex, but later it could not be made out. Heart-dulness small (emphysema). Heart-beats arhythmic. Arterio-sclerosis. Right lobe of thyroid considerably enlarged. Veins of the neck distended. A little outside of mammary line, over the ninth rib, is a fistula leading to the bone, from which some pus can be expressed. Similar fistula at upper end of right tibia. (The pus contains no tubercle bacilli.) Examination of the sensibility of the whole body shows nothing abnormal. Senses of smell and taste normal; facial nerves also. Ticking of watch heard with each ear in 10–12 *cm*. During phonation uvula is drawn somewhat to the right, and the right side of soft palate contracts a little stronger than the left. No difficulty in swallowing or speaking. Knee-jerk missing, but Romberg's symptom and a feeling of constriction about the waist absent. In walking, patient keeps his feet rather far apart and is a little unsteady, especially in turning around; but this slight degree of ataxia is sufficiently accounted for by the advanced age of the patient and the diplopia later to be mentioned.

Urine contains $\frac{1}{8}$ per cent. sugar; no albumen.

On the part of his *eyes* the patient has hitherto had no cause for complaint. About five weeks ago, while looking out of a window in the morning, he first noticed that all objects appeared double. During the previous day and night he had felt perfectly well, and experienced no dizziness, headache, vomiting, nor other cerebral symptoms. The diplopia was noticeable only to a slight degree while looking straight ahead, but was marked on turning the eyes to the right or to the left. The patient is under the impression that he does not see quite as well as before, and does not as readily recognize persons on the street.

As he entered the dispensary a certain rigidity in the expression

of his eyes was conspicuous, the cause of which was readily seen to lie in a marked diminution of the voluntary lateral movements of the eyes. This defect the patient tried to make good by clumsy rotation of the head and even of the whole body.

The condition of the eyes was as follows: V, R and L, = $\frac{6}{36}$, with + 2. 25 D sph. = $\frac{6}{10}$. Reads N 1 with + 5.0 D in 30 *cm.* Pupils rather small; react well to light and with convergence. When patient looks straight ahead the left eye appears to deviate slightly inwards (2–3 *mm*). Up and down movements of both eyes and lids normal, both when the eyes are examined singly and together. In *monocular* examination of the left eye its power of abduction is found to be completely, that of adduction almost completely, lost; when tested in a like manner, the right eye shows only a small loss in the power of abduction, inasmuch as the outer border of the cornea can be brought 2 *mm* from the outer commissure. The action of the internal rectus is more defective, since the eye can be turned only 4 *mm* inwards from the middle line. In *binocular* examination of the lateral movements, the action of the left external rectus is again found entirely lost, while the action of the left internal rectus rises to 3 *mm*; on the right eye the action of the external rectus is the same as in the monocular test, but *that of the internal rectus disappears almost wholly.* In other words, the power of both eyes, when uncovered, to follow the finger towards the left is entirely lost, while rotation to the right is only diminished, *but more markedly on the part of the left internal rectus than of the right external rectus. The power of convergence is normal* in both eyes since it reaches to 10 *mm* of the bridge of the nose.

The examination for double images gave results in harmony with those of the objective examination of the movements of the eyes. In the primary position, with a red glass before one eye, homonymous images, corresponding to the convergence; on moving the light towards the right, the images approached each other and then became crossed, in accordance with the less marked paresis of the right external rectus as compared with that of the left internal rectus. Towards the left side the distance between the homonymous images increased, in spite of the complete paralysis of the associated movements towards this side. The explanation of this fact will be given later.

Field of vision for white and colors normal.

Diagnosis.—Hemorrhage or embolism in the floor of the fourth ventricle, in the neighborhood of the left sixth nucleus, with in-

volvement of (or pressure upon) the region of the right sixth nucleus.

Treatment.—Sodium iodide, gr. viii., t. i. d., covering of one eye. An antidiabetic diet cannot be carried out on account of lack of means of the patient.

Course.—On Feb. 2d the only change in the movements of the left eye is that the power of the internal rectus is now also almost lost in binocular examination. The action of the right external rectus likewise shows a change, inasmuch as the eye does not remain quiet in the abducted position, but recedes from it slowly and then again moves outward with a rapid jerk; action of the internal rectus unchanged. The power of rotating the eyes to the right has, therefore, further diminished. On looking straight forward the left eye seems to deviate farther inward than before, and the double images, when tested at a distance of six feet, are now $\frac{3}{4}$ instead of $\frac{1}{2}$ ft. apart. The urine steadily contains $\frac{1}{8}$ to $\frac{1}{4}$ per cent. sugar.

February 4th.—Action of the left internal rectus in lateral rotation now entirely absent, but continues good in convergence. No further change.

On February 6th urine contains no sugar, but on 13th it contains more than in the beginning (about 1 per cent.).

February 19th.—Marked improvement in the condition of the eyes. Both internal recti now turn the eyes 3–4 *mm* in the associated lateral movement. Urine free from sugar.

February 24th.—Further improvement. Both internal recti show increased action, both during monocular and binocular testing of the lateral movements. The left external rectus now also shows an action of about 2 *mm*, but only during binocular examination.

February 26th.—Slight further improvement. In forced abduction the right eye now makes short nystagmic movements, instead of the hitherto slow ones. Without a red glass before one eye the patient no longer sees double when looking straight forward. But to the left, beyond an angle of 10°, he has homonymous diplopia; to the right heteronymous diplopia, but only after an angle of 30° has been passed. Spontaneously the patient sees double only in the extreme lateral directions.

March 3d.—Examination without a red glass gives the same result. With a red glass before one eye there is homonymous diplopia in the middle line, on account of the still existing con-

vergence of the axes. The disturbance between the images increases towards the left. Towards the right it diminishes, so that at an angle of 20° the patient sees single, but beyond this heteronymous diplopia begins. If the light is gradually brought nearer to the eyes in the middle line, the patient cannot fuse the images until the candle has been approached to one-half metre, but he can now hold the images together when the candle is slowly withdrawn up to 1½ metre. Beyond this distance the diminished power of abduction again shows itself and homonymous diplopia reappears.

March 6th.—Left external rectus tires rapidly and shows greater action during binocular than monocular examination.

March 13th.—Marked improvement. Towards the right there is no longer diplopia; towards the left it is homonymous beyond an angle of 15° to 20°.

March 15th.—Suppuration of the right inguinal gland, probably secondary to the suppuration in right tibia. During the last few weeks the urine at times was free from sugar, at times it contained as much as 1 per cent.

March 19th.—Patient is able to follow the finger with his eyes towards the right well, towards the left with difficulty. One difference between the results of monocular and binocular examination still exists, *i. e.*, in the former the action of the left external rectus is found to be weaker than in the latter.

April 8th.—On the left supraclavicular fossa a carbuncle, the size of a hen's egg, has appeared.

April 14th.—Incision of the carbuncle. Status of the eyes about the same as on March 19th. V, R = almost $\frac{6}{6}$ with + 3.0 D, V, L = $\frac{6}{6}$ with + 2.5 D.

April 18th.—Movement to left shows slight further improvement, for the left cornea can be brought to 3 *mm* from the outer canthus. Urine contains 4 per cent. sugar.

May 16th.—Amount of sugar in urine during intervening time very variable. On dorsal surface of right forearm deep abscess is forming. Wound on left shoulder almost healed. Eyes unchanged.

June 2d.—Last examination. Paralysis of eye muscles is practically healed. The nystagmic movements of the right external rectus have almost disappeared, while the muscles which turn the eyes to the left merely show a slight tendency to become tired. The power of convergence has steadily remained perfect. The swelling on the right forearm has increased.

Although we had repeatedly requested the patient to show himself at regular intervals, and although his relatives had promised to inform us of his admission to a hospital, should it occur, we saw and heard nothing further of him until, in the beginning of August, we accidentally found out that two weeks before the patient had been taken to a hospital and had died there the following day. Further inquiry developed the fact that he had been admitted in a comatose condition, and that on account of the want of all history, no certain diagnosis could be made before death. The autopsy did not reveal any direct cause of death. The autopsy record contained the following notes:

"Atrophy of cerebrum; chronic fibrous leptomeningitis. *No localized lesions in the brain.* Œdema and emphysema of lungs; yellow atrophy of heart and liver; chronic perisplenitis; parenchyma of kidneys, granular and opaque; fatty degeneration of the epithelium of the tubules; small adenoma of left kidney; chalky deposits in mesenteric glands; slight arterio-sclerosis; vascular, malignant (?) struma on right side; chalky deposits in both lobes of thyroid; fistulous, necrotic area in right tibia and radius, with penetrating odor (syphilis, or diabetic gangrene?)."

Taking into consideration the facts that the autopsy revealed no lesion that could be the direct cause of death, and that the urine had almost steadily contained sugar, sometimes as much as 4 per cent., we are not likely to err in the assumption that the patient died in diabetic coma. At the autopsy the medulla and pons were divided by a number of transverse sections; but as the physician in charge was not aware that a paralysis of the eye muscles had preceded, the region of the nerve nuclei was not examined with that degree of minuteness that is required in order to find so small a lesion as must have existed here.

In this case, therefore, we had to deal with a bilateral paresis, almost paralysis, of the associated lateral movements of the eyes with complete retention of the power of the internal recti in convergence, which paralysis passed into almost complete recovery before the patient's death. What makes this case notable, however, and of considerable interest, is its absolute pureness, the complete absence of any accompanying aralytic symptoms on the part of both the motor and sens-

ory nervous system. The rarity of such a picture is recognized from the fact that I have been able to find only four similar cases, which are almost all of rather recent date. They are, in brief, as follows:

1. Milliken.[2] Man, thirty-three years old, alcoholic, for years attacks of diplopia. Power of lateral movements completely lost, but that of convergence retained. Only complicating symptom, but which is of no importance, was a slight weakness of right orbicularis. After two weeks' treatment with potassium iodide, rotation to right completely, that to left almost completely, recovered.

2. Bristowe.[3] Paralysis of associated movement to the right, with conjugate deviation to the left, to which was added later paralysis of the movement to the left, so that the eyes again looked straightforward. The other movements of the eyes, including convergence, remained normal. The autopsy showed tubercle of the pons, situated mainly in the left half; exact seat not mentioned in the reference.

3. Hotz.[4] Druggist, twenty-two years old, previously healthy, not syphilitic, and moderate in the consumption of alcohol. Complete inability to follow the finger with the eyes either to the right or left. Up-and-downward movement normal. Right eye deviated 10° inwards. (Whether or not convergence was affected is not mentioned.) This case can be classed in the category of ours only in its beginning, for later paresis of the right, and then of the left, facial nerve and of all extremities supervened. Complete recovery after seven months of treatment with potassium iodide and strychnine.

4. Thompson.[5] Blacksmith, fifty-five years old, hitherto healthy, who was suddenly overtaken with paralysis of the muscles moving the eyes laterally, accompanied by dizziness. External recti completely, internal recti almost completely, paralyzed. Convergence, as well as up-and-down movements, normal. Axes of eyes slightly convergent. Improvement after use of potassium iodide, so that after six months there was merely slight paresis of left external rectus left.

The following two cases are not quite pure:

Block and Guinon.[6] Man, sixty-two years of age, with transitory anæsthesia of left half of body. Later, accompanied by general

cerebral symptoms, loss of associated lateral movement to the right, with rotation of head to the left. Later still, loss of associated movements of eyes to left, while convergence remained good. Autopsy showed two tubercular nodules in the floor of the fourth ventricle, reaching to the upper third of the pons, entirely destroying the right sixth nucleus and causing pressure upon the left one.

Zimmerman.[7] Girl of nineteen years having double-sided paresis of conjugate lateral eye movements with retained convergence. Besides, there existed occasional defective raising of left upper lid, paræsthesia of the extremities, and weakness of the right leg.

Isolated paralysis of the associated lateral movement towards *one side only*, I have found mentioned three times in the literature:

Graux (cited by Hunnius[8]). Twenty-one-year old man with attacks of headache, vertigo, etc. No anæsthesia nor paralysis, except on the part of the eye muscles, as follows: In the binocular test, rotation of both eyes is paretic, inasmuch as "the eyes are turned to the right with difficulty and with nystagmic movements." In the monocular test, however, only a paresis of the right external rectus is visible, for when the right eye is covered, *the left eye is seen "to execute all movements without difficulty. Convergence was entirely normal."* Later, the paralysis increased, so that the left eye showed, even with the monocular test, diminished power of rotation toward the right. The autopsy revealed a tubercular nodule in the floor of the fourth ventricle occupying the region of the sixth nucleus.

De Vincentiis.[9] Girl, thirteen years old, having merely a paralysis of the right external and left internal rectus, caused by a cheesy tubercle in the region of the right sixth nucleus.

Swanzy.[10] Case of a child with probably congenital deviation of the eyes to the right, and great diminution in the power to rotate eyes to the left, while convergence was normal.

I have only mentioned here the pure and uncomplicated cases because they give convincing evidence of the dependence of the clinical symptoms upon the existing lesion. The numerous cases published* in which similar groups of symp-

* A full list of cases is given by Hunnius (*l. c.*) up to 1881, and by Dufour (*Annals d'Oculistique*, March–April, 1890).

toms on the part of the eyes were complicated by paralyses of other parts of the body, are also of interest in connection with the questions to be discussed here, but it would carry me beyond the purpose of this publication, to mention them all.

In passing to the consideration of the diagnosis in our case, the assumption concerning the *seat of the lesion* must first be justified. The question arises whether it is right to localize it in the region of the sixth nuclei. The bilateral nature of the affection can be no objection thereto, for a lesion need by no means be extensive in order to involve both these nuclei which lie close to the middle line. That the seat of the lesion could not be peripheral or at the base of the brain, is perfectly clear. A fascicular seat can also readily be excluded, for nowhere in the pons do the fibres that form the oculomotor and abducens nerves approach each other so closely that a single lesion could affect them both, without at the same time causing other extensive paralyses.

Furthermore, the bilateral nature of the affection makes a cortical seat too improbable to be considered. There remain only two possibilities between which a differential diagnosis must be made, a nuclear and a corticofibrillar (Dufour) seat, the latter being at that point where the tracts for the voluntary conjugate lateral movements of the eyes, connecting the cortex with the nuclei of the opposite side, cross each other.

If we decide in favor of the former of these two possibilities, namely, that the lesion is situated in the region of the sixth nucleus, we must assume that each sixth nucleus governs the action of the rectus internus of the opposite side during conjugate lateral movement, and consequently must send nerve-filaments to its respective oculomotorius. For the correctness of this supposition a number of proofs, some more, some less convincing, have already been brought forward.

By means of experiment the proof has been most difficult to adduce. Probably the best results were attained by Laborde, Duval, and Graux,[11] who by irritation of the nucleus of the sixth nerve caused conjugate deviation to the

same side, and by destruction of this nucleus caused deviation to the opposite side; but this proof, obtained by experiment on animals, cannot unreservedly be applied to man.

Anatomically proof has been furnished by Duval [13] and other authors * who claim to have found a bundle of fibres passing through the posterior longitudinal tract and connecting each sixth with the opposite third nucleus.

The most convincing proof is given by closely observed cases of paralysis of the associated lateral eye-movements, which, *by an autopsy*, were shown to be caused by sharply defined lesion of the pons at the regions of the sixth nerve nuclei. Three such cases, those of Graux, de Vincentiis, and Block, and Guinon have been cited above. Four others, of Féréol,[13] Hallopeau,[14] Wernicke,[15] and Poulin [16] are mentioned by Hunnius. Dutil [17] also describes a case of hemiplegia of the right side, paralysis of the left facial nerve and of the movements of the eyes towards both sides, while convergence remained normal. A hemorrhage was found in the middle of the pons under the floor of the fourth ventricle, involving both sixth nuclei. Finally, there is the case of Bennett and Savill,[18] showing paralysis of the left arm and lower branch of the facial, together with loss of the conjugate movement of the eyes to the left, convergence remaining unaffected. The former symptoms were caused by an area of softening in the right ascending frontal convolution, while the latter was due to a second area found in the left sixth nucleus.

In all of these nine cases a circumscribed lesion, either a tubercular nodule, a softening, or a hemorrhage, had injured one or both sixth nerve nuclei, sometimes with involvement of the immediate neighborhood and sometimes not, but in each case *leaving the third nerve nucleus absolutely unharmed.*

By the foregoing evidence the connection between the sixth nucleus and the internal rectus of the opposite side (which, in fact, is now quite generally accepted) seems sufficiently established.†

* *Cf.* Hunnius, *l. c.*, p. 69.

† Mauthner [19] in his lectures expressed the opposite conviction, but it would lead me too far to discuss his opinion here.

It is, however, not yet proved whether this connection is a direct or an indirect one through the nucleus of the rectus internus. The latter is by Gowers [20] deemed the more probable, and for it the cases of Wernicke [21] and Bernhardt [22] may be cited. In these cases destruction of a sixth nucleus had caused loss of the movements of the eyes towards one side, while microscopic examination showed degeneration of the sixth nerve, but none in the third nerve.

All the above considerations are evidence in favor of localizing the lesion in our case in the region of the sixth nucleus, but the assumption of a corticofibrillar seat of the lesion remains to be refuted. According to Gowers (*l. c.*) the tracts which connect the cortex with the sixth nuclei, and which conduct the impulses for the associated lateral movements, cross each other probably in the region of the corpora quadrigemina; so it is readily conceivable that a small lesion, situated just at this point of crossing, might cause exclusively a loss of the lateral movements of the eyes, leaving the power of convergence undisturbed. Thompson did, in fact, believe this point to be the most probable seat of the lesion in his above-mentioned case. But in Thompson's as well as in our case, the two muscles which physiologically act together in lateral movements, were not paralyzed in an equal degree, and herein, it seems to me, a valid objection exists to localizing the lesion above the nuclear region. Each of the tracts under discussion carries the impulses for lateral rotation of the eyes sent from the cortex to the sixth nucleus, and if this conduction is interfered with to a greater or less degree, a correspondingly great deficiency in this function must ensue. This deficiency must be the same on the part of the rectus internus and its associated rectus internus. For, if the normal impulse is distributed equally over the two muscles, the partial or complete loss of this impulse must also be distributed equally.

On the other hand, it is very easy to explain an unequal degree of paralysis in the two associated muscles, if the lesion is localized in the sixth nucleus. It is merely necessary to assume that those ganglionic cells of the sixth nucleus, which send nerve-fibres to the opposite rectus internus,

are grouped together, and either abut against the rest of the sixth nucleus or are separated from it by a slight intervening space, as has already been found to be the case with the various portions of the third nucleus. It would then merely be necessary that the one portion of the sixth nucleus were more seriously affected than the other, and a difference in the action of the associated muscles would result.

In favor of such a structure of the sixth nucleus a number of clinical observations are on record: Wernicke[23] described a case of tumor of the pons in which existed, at the height of the disease, paralysis of the conjugate movements of the eyes towards each side and right hemiplegia. The muscles of the eyes did not, however, become paralyzed simultaneously, but slowly, one after the other, in the following order: Right external, left internal, left external and right internal rectus. After treatment with potassium iodide the paralysis disappeared in inverse order. In Zimmermann's case, while the ocular paralysis was waning, there also existed a difference in the power of the muscles of each conjugate pair, a difference which the author was inclined to explain by assuming that only a part of the sixth nucleus was diseased at that time. In Thompson's case both internal recti had completely recovered, while the external recti were still paretic in a high degree; and in our case the right external rectus was not paralyzed to such an extent in the beginning, as was the left internal rectus. Since in the two former cases the non-ocular symptoms point with certainty to a lesion in the pons, *i. e.*, in the region of the sixth nucleus, it seems to me that thereby the proof is furnished that the ganglionic cells of the sixth nucleus for the associated external and internal recti must be grouped apart, and that these two groups must be separated at least so far from each other, that they may be affected in an unequal degree by one and the same lesion. Accordingly the lesion in the latter two cases, Thompson's and our own, must also be localized in this region. To determine the exact relative position of these two portions of the sixth nucleus to each other, the data at our disposal are insufficient. The way in which the lesion in Wernicke's case progressed shows, how-

ever, that the group of cells for the internal rectus can not lie to the median side of that for the external rectus, otherwise the former must necessarily have been attacked first, when the disease crossed the middle line.

Based upon the above considerations, the following conclusion can, I believe, justly be drawn:

If two muscles, concerned in the associated lateral movements of the eyes to one side are paralyzed in an equal degree, the lesion may be situated either in or centrally from the sixth nucleus: but if, during any stage of the disease, these muscles are affected in an unequal degree, the lesion can be only in the region of the sixth nucleus.

As for the *nature of the lesion* in our case, there can hardly be any doubt that it consisted in hemorrhage. Both the sudden onset and the transitory nature of the disease are in favor of this diagnosis. To a certain degree the result of the autopsy can also be considered a negative proof, for a tumor could hardly have been overlooked at the autopsy where pons and medulla were divided by cross-sections; while the traces of a hemorrhage might, after a period of six months, be undetectable on macroscopic examination. Nor is an embolism assumable, for it is highly improbable that two small vessels, situated symmetrically on each side of the middle line, should be stopped simultaneously.

A predisposition to hemorrhage existed in the presence of the arterio-sclerosis together with the diabetes. Though at first we were inclined to consider the glycosuria as a symptom coördinate with the muscular paralysis, as is seen frequently enough in lesions on the floor of the fourth ventricle, the circumstance that the paralysis steadily improved, while the amount of sugar in the urine fluctuated and, on the whole, increased, made the diagnosis of a real diabetes seem the more probable. The formation of the carbuncles later on, fortified this supposition.

It may be of further interest to discuss a few of the important symptoms of our case.

The fact that during the whole period of observation the action of the internal recti in executing convergence remained completely intact, while in the execution of the lateral move-

ments it was, for a time, completely destroyed, is proof of the double innervation of these muscles, and of the existence of a separate centre for convergence. These questions can, however, be considered as already solved, requiring no further discussion; but intimately connected with them is the interesting question of the difference in the motility of the eyes in monocular and binocular testing, that is sometimes observed in cases of paralysis of the lateral movements with normal power of convergence. This symptom has not been described frequently. It existed in the cases of Féréol, Poulin, and Graux. Alfred Graefe [34] in his paper read before the Seventh International Congress of Ophthalmologists on "The Action of the Internal Recti in Associated Lateral Movements and in Accommodative Convergence," mentions two other cases in which this symptom was noticed, the one published by himself,[35] the other by Moebius.[36] To these cases ours must be added. In Féréol's case binocular examination showed complete loss of rotation to the left, convergence remaining good. When, however, the left eye was covered, the right eye was able to make an inward motion. In Graux's case there was a diminution of the power to turn the eyes to the right, convergence was normal, but in monecular testing the left eye moved inwards more freely than in binocular testing. Poulin's case showed paralysis of the lateral movement to the right, but marked activity of the left rectus internus in monocular examination. The condition of the power of convergence is not mentioned, but we can assume it to have been normal, since the lesion was limited to the level of the sixth nucleus and nowhere approached the third. The two cases of Alf. Graefe and Moebius showed probably a congenital complete paralysis of the lateral movements to each side with integrity of convergence, but in both cases the eyes were able to make an inward movement in monocular examination. In our case, finally, the right internal rectus showed complete inactivity in the binocular test of rotation to the left, whereas when the left eye was covered the patient was able to move the eye inwards to the extent of 4 *mm.*

How is this difference of motility in monocular and bin-

ocular testing to be explained? According to Hunnius, Féréol explained his case in the following way: he assumed "that the internal rectus has two centres of innervation. The one it has in common with the sixth nerve of the opposite side. . . . Besides, it has a centre in the nucleus of the oculomotor nerve, which, however, becomes active only in monocular testing, and then only when the other centre is paralyzed. Hunnius[1] justly denotes this explanation as highly improbable, and agrees with that given by Wernicke. According to him, the reason why the paralyzed rectus internus shows greater motility in monocular than in binocular examination is, that in the former case "it is forced to fixate more firmly."[2] This explanation is probably correct as far as it goes, but it does not make clear by what means this difference is brought about.

Moebius has given an explanation which is in harmony with all observations, when he claimed that the inward movement, which could be accomplished in his case only during monocular testing, was an *act of convergence*. A positive proof of the correctness of his opinion he found in the observation that the covered eye also assumed a convergent position when the uncovered eye moved inwards.

In our case, examination in regard to this point was unfortunately omitted, so that it cannot be used as direct evidence in favor of Moebius's opinion; yet the following observation seems indirectly to prove its correctness: The history shows that at the height of the disease the patient could not respond at all with the left external, and only in a minute degree with the right internal rectus, to the most urgent request to look to the left. Consequently, one would expect that the distance between the double images, caused by the convergence of the axes of the eyes, would increase only by a scarcely noticeable amount when the candle was carried to the left. In fact, however, this distance increased from 15 to 60 *cm* when the light was moved to the left with a radius of two metres. This fact can be explained only by an act of convergence which was executed in the in

[1] *L. c.*, p. 55.

[2] *L. c.*, p. 66.

terest of distinct vision with at least one, namely, the right eye.

The following general argument further substantiates Moebius's explanation: In looking over the last-named six cases, it is noticeable that it is always the *internal* rectus which shows the greater activity in monocular, as against binocular, testing. This very rare symptom was, however, in each case, combined with another rare symptom, namely, a good power of convergence together with paralysis of the associated lateral movements. This relatively frequent union of two rare conditions cannot be considered a play of chance, but points strongly to a causal relation between them in the sense that the greater action shown by the internal rectus in the monocular test depends upon the existence and the use of the power of convergence.

Under the date of March 6th, in the history of our case, another difference between the results of monocular and binocular testing is mentioned. This time it was the external rectus, which in binocular examination acted stronger than in monocular examination. The probable explanation for this is that a stronger impulse to lateral movement was given when the right eye, whose internal rectus was less paretic than its conjugated partner, could also take part in the act of vision, thereby urging the left external rectus on to greater effort in order to avoid diplopia.

In concluding, there remains to be given the explanation for the convergent position of the left eye, which existed for some time in our case. Our explanation is based upon the double innervation of the internal recti. In the early stage of the disease the left external rectus was completly paralyzed, the internal rectus much weakened in the accomplishment of lateral rotation, while on the right eye the internal rectus was paralyzed, the external rectus only slightly weakened. Both internal recti were efficient in producing convergence. From this it follows that both internal as well as the right external rectus were still connected with functionating nuclei and, consequently, retained their tonus; the left external rectus, being completely paralyzed, had lost its energy. As a result, the right eye re-

tained its normal equilibrium, while the left eye gave way to the greater influence of its internal rectus and turned inwards.

To Dr. SAMELSOHN I wish to express my sincere thanks for the kind permission to publish this case.

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CLINICAL AND MICROSCOPIC REPORT OF A NON-PERFORATING SERPENT ULCER OF THE CORNEA CAUSED BY THE PNEUMOCOCCUS.

By Dr. WARD A. HOLDEN.

(*With three figures on Text-Plate II.*)

IT is rare that the death of a patient with serpent ulcer enables one to obtain the eye for examination while the disease is still in an active stage and perforation has not yet taken place; and the present case is reported because it confirms the current idea of the pathology of this disease, shows clearly the manner of development of the causative micro-organism, and is suggestive as regards treatment.

November 23, 1897, I saw a weak, apathetic infant, ten months of age, which, some time before, had been admitted to the St. John's Guild Free Hospital for Children, Dr. Dillon Brown's service, with bronchial and other symptoms. At the time of admission the eyes were normal, but later an ulcer of the right cornea was discovered. This ulcer occupied the centre of the cornea, was about 10 *mm* in diameter, shallow, and irregularly circular in form. It had a grayish coating, and the margins were somewhat infiltrated. There was but little vascular injection of the eyeball. Some fluid pus lay in the anterior chamber. There was neither dacryocystitis nor conjunctivitis.

Atropine was instilled often enough to keep the pupil fully dilated throughout the course of treatment, and warm moist applications were made. The ulcer was touched with tincture of iodin on a cotton-wrapped probe, and the following day appeared cleaner. On the third day dense purulent infiltrations appeared at various points in the floor and at the margins of the ulcer, and these were

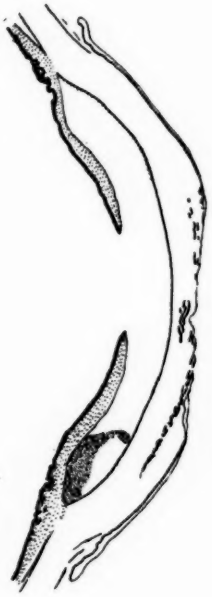

FIG. 1.

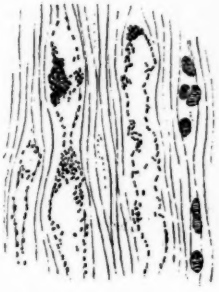

FIG. 3.

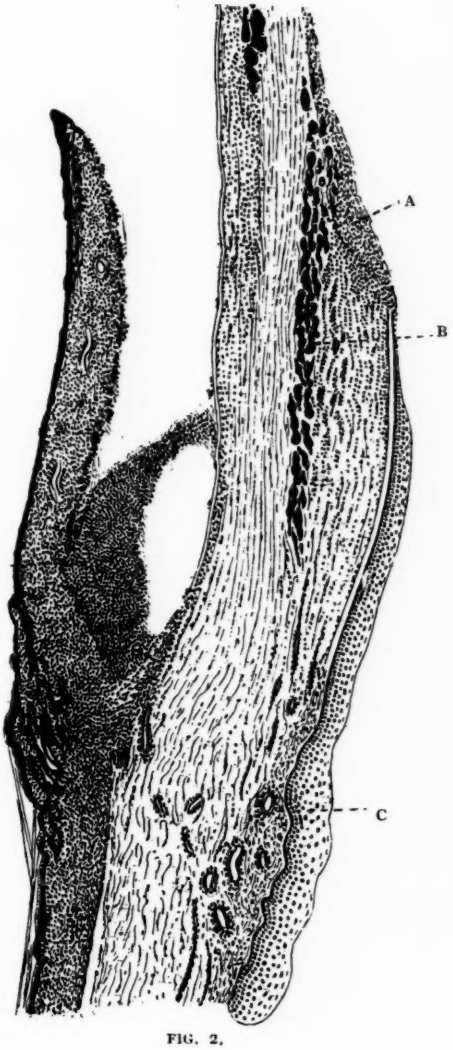

FIG. 2.

Illustrating Dr. Holden's Paper.

Holden, del.

cauterized with the platinum probe. This cauterization was repeated whenever the infiltration became considerable at any point, while the general surface of the ulcer was touched with tincture of iodin once or twice in the twenty-four hours as its condition seemed to demand. In the infant's apathetic state this caused no pain.

At one time a very dense, though limited, purulent infiltration appeared near the centre of the ulcer, and just behind it was seen, clinging to the posterior surface of the cornea, a mass of spongy hypopyon, while at the bottom of the anterior chamber lay fluid hypopyon, as before. The point of purulent infiltration was cauterized, and the following day the spongy hypopyon attached to the cornea had disappeared entirely and it did not return.

The extension of the ulcer, after treatment was begun, was inconsiderable and on the ninth day the margins had become quite clean in places and were no longer undermined, and the marginal epithelium appeared to be regenerating. The infant, which had been growing weaker daily, died on the tenth day.

At the autopsy, consolidation was found in both lungs and there were evidences of extensive bronchitis. The eye was removed eleven hours after death, and twenty-four hours after the last application of iodin. In using too large a pair of scissors to divide the optic nerve the pressure forward caused a minute rupture at the thinnest point in the centre of the ulcer, and some aqueous escaped.

The ball was put into 5 per cent. formol solution for four hours, and then divided equatorially. The anterior segment was put into alcohol, first 80 per cent. and then 95 per cent. for a few hours, and then divided by a vertical section through the centre of the ulcer. One half of the cornea was separated from the other tissues, placed for two hours in absolute alcohol, and then imbedded in paraffin and cut in thin sections for the study of the micro-organisms. The other half of the cornea, with the sclera and uvea attached, after being put into absolute alcohol for a few hours, was imbedded in celloidin and cut in thicker sections for topographical study.

Histological.—The diagram, Fig. 1, Text-Plate II., represents a section passing through the ulcer a little distance from its centre. There is but slight thickening of the cornea

about the ulcer, its margins are no longer undermined, and its floor is fairly clean. Scattered here and there beneath the floor of the ulcer, however, and thence spreading laterally into the middle layers of the healthy portions of the cornea, are colonies of pneumococci (indicated by the dark marks in the diagram), some of which may be of post-mortem growth. The healthy cornea in the upper part of the diagram is lined on its posterior surface with the normal endothelium, but in the region of the ulcer and below it the endothelium has been cast off. At the bottom of the anterior chamber is a collection of pus.

In Fig. 2 the inferior margin of the ulcer is shown at A. From the normal epithelium lower down a thinner layer of epithelium only two cells deep now extends up along the membrane of Bowman to its end at the margin of the ulcer. In sections through other parts of the specimen, where the floor of the ulcer has become clean, this thin layer of newformed epithelium is already dipping down into the defect. At A, however, there is still a mass of necrotic corneal tissue and leucocytes. Below this, and anterior to the colonies of pneumococci represented by the black patches, the corneal lamellæ are preserved, but they are separated and undulatory instead of flat, because the lymph spaces between them are distended with liquid and groups of leucocytes. This infiltration of the anterior layers extends to the periphery of the cornea, gradually becoming less dense. Beyond the sclerocorneal junction are seen, at C, dilated episcleral vessels, from which the leucocytes have passed out to wander into the cornea and collect about the ulcer.

The middle layers of the cornea are unaffected, but the deep portion beneath the floor of the ulcer is again densely infiltrated. This infiltration occupies, in the centre of the cornea, eight or ten lamellæ, but toward the periphery of the cornea the infiltrated portion narrows down to no more than two or three. The source of these leucocytes is found in the deep scleral and the uveal vessels near the angle of the anterior chamber.

The iris and ciliary body in their entirety are densely infiltrated, and leucocytes have been thrown out on the an-

terior surface of the iris. Leucocytes, some pigment, and a little fibrin make up the hypopyon. In life the hypopyon was fluid, and no significance attaches to its form in the hardened specimen.

The membrane of Descemet is intact, except at the point where it was ruptured with the deep lamellæ in the floor of the ulcer in the removal of the eye. The layer of endothelial cells lining the membrane of Descemet is normal at the upper margin of the cornea, but a little distance from the margin the cells appear farther apart and faintly stained, until, behind the ulcer and below it, they have been cast off altogether. In Fig. 2 no endothelial cells are seen, there being attached to the membrane of Descemet only a few groups of leucocytes held together by fibrin. The cast-off endothelial cells, which may sometimes be found among the leucocytes in the anterior chamber, were not discovered in this case. No pathological changes were found in the posterior segment of the ball.

This specimen illustrates most typically the idea of the pathogenesis of hypopyon keratitis which Leber described, and which later observers have confirmed, and of which I have personally become convinced by the study of experimental staphylococcus ulcers in the rabbit. The process, though familiar, may be briefly restated. Pathogenic micro-organisms gaining entrance to the corneal tissues develop soluble toxins, which, being diffused toward the nearest vessels, attract the leucocytes toward the focus of infection by the process called chemotaxis. The leucocytes, wandering in the direction of the greater concentration of the toxins in the lymph, arrive at the focus of infection, where they lose their vitality from the virulence of the toxins, after which the corneal lamellæ break down and the entire necrotic mass sloughs off, thus, in favorable cases, extruding the infecting micro-organisms.

The epithelium is cast off for some distance about the ulcer, and in the stage of repair it pushes out in a thin layer to cover the defect. The endothelium, likewise, is cast off behind the ulcer.

The infiltrating leucocytes come from the nearest vessels.

When the point of infection is superficial, and near the margin of the cornea, the leucocytes pass out mostly from the nearest episcleral and conjunctival vessels. When the point of infection is deeper or nearer the centre of the cornea, the deep scleral and uveal vessels furnish a large proportion of the leucocytes, and iritis and hypopyon are more likely to be present.

The leucocytes in and about the ligamentum pectinatum, in part pass out among the posterior lamellæ of the cornea, and wander inward and gradually forward toward the point of infection; in part these leucocytes wander along the endothelium on the posterior surface of the cornea toward the point of infection; and in part they are thrown out into the anterior chamber, where they float free in the aqueous humor and settle down to the lowest point. Quantities of leucocytes are thrown out from the iris also. When the infection is very virulent the fibrin-forming elements of the blood also are poured out into the anterior chamber principally from the iris, and where the endothelium has been cast off from the posterior surface of the cornea, masses of fibrin are deposited on the membrane of Descemet, and leucocytes in great number wander into this fibrin. In this way is formed the spongy hypopyon that was observed in this case, and which disappeared after cauterization of the ulcer. This spongy hypopyon clinically presents the picture of a mass of pus flowing through the base of the ulcer and trickling down on the posterior surface of the cornea, and it was, formerly, commonly so interpreted. When but little fibrin is formed the leucocytes in the anterior chamber gravitate down to the bottom, where they lie as a fluid hypopyon. After the source of infection is removed the fibrin is soon absorbed and the leucocytes of the hypopyon are taken up again through the ligamentum pectinatum.

Bacteriological.—The last statistics of Uhthoff and Axenfeld[1] show that in true serpent ulcer—the shallow ulcer spreading laterally with undermined edges and accompanied with hypopyon—the micro-organism which is almost invariably found in scrapings of the ulcer is the diplococcus

[1] *Graefe's Archiv*, xliv., 1.

lanceolatus, or pneumococcus of Fraenkel, usually in pure culture.

In the present case the only micro-organism found was a lance-shaped diplococcus with all the characteristics of the pneumococcus, and there can be no reasonable doubt of the diagnosis, although unfortunately this was not confirmed by cultures.

The colonies at or near the surface of the ulcer do not take the stains well, showing that their vitality had been destroyed by the treatment. Many of the deeper colonies, which stain well and which may have grown somewhat after death, are seen to have pushed laterally along the lymph spaces for a considerable distance, without departing far from the plane in which they first entered the cornea from the margins of the ulcer. It is easy to understand, from the direction of growth of the micro-organisms, as shown in Fig. 2, why the ulcer which they cause should spread laterally rather than into the depth of the cornea, and why the actively spreading ulcer should have overhanging margins.

In Fig. 3 are shown four adjacent inter-lamellar lymph spaces, one containing leucocytes and three containing growing colonies of pneumococci. The lamellæ are to a certain extent separated into their component fibrillæ. The pneumococci, in spreading, are seen to proliferate along the walls of the lymph spaces, the lance-shaped diplococci lying mostly end to end. At various points there is a more general proliferation forming masses of cocci, and, finally, with further growth the entire lymph space is seen to be distended with these masses, as is shown in Fig. 2. The extension of the colonies can always be traced back to the surface of the ulcer. The growing colonies have surrounded and invaded leucocytes lying in their path, but no leucocytes containing cocci are found at a distance from the colonies, nor are isolated free cocci found in the lymph spaces, showing that the leucocytes which have taken up the micro-organisms have not migrated back toward the periphery of the cornea, and that the lymph currents have not carried the micro-organisms away from the ulcer. Furthermore, no micro-organisms are found in the hypopyon. In cases of

beginning panophthalmitis following perforation of a cornea infected with pneumococci, Uhthoff and Axenfeld, and Mündler[1] have found numbers of leucocytes containing pneumococci wandering in the vitreous and carrying the infection to the retina. The spreading of the infection in the cornea, however, would seem, in our case at least, to have been by direct extension of the colonies only.

The infection of corneal defects with the pneumococcus can usually be traced to pneumococci in the secretion of a dacryo-cystitis where they are almost always to be found, or to pneumococci which are frequently present in conjunctival secretion. In this case the most probable source of infection was the saliva, the infant having bronchitis and pneumonia.

Treatment.—To those who do not pin their faith to subconjunctival injections, and to those who regard the Saemisch operation only as a last resort, there are offered, besides the simple scraping or washing out of the ulcer, three means of treating serpent ulcer at its inception: 1st, by applying tincture of iodin, other strong solutions of antiseptic agents, or weak solutions of caustics, which have the advantage of not destroying normal tissue but which thoroughly sterilize the surface although they may not reach the deeper colonies; 2d, by applying concentrated caustics, such as carbolic acid, which extend deep and are more efficient than the first mentioned agents, but which destroy the normal tissues with which they come in contact and produce disastrous effects upon the conjunctiva; and 3d, the actual cautery, which is the most efficient of all, but which also has the disadvantage of destroying normal tissue, thus often increasing the size of the resulting scar in ulcers which terminate favorably.

The good effects which the tincture of iodin and such remedies have when used in the treatment of simple corneal ulcers, undoubtedly have led such of us as use them into the habit of employing them, in the beginning, in small ulcers of any description. In this way, deeper colonies may be allowed to spread, and in order later to reach with the cautery colonies such as those shown in Fig. 2, a considerable portion of the healthy cornea would have to be sacrificed, so that the

[1] Mündler, *Beiträge z. path. Anat.*, etc. Zeigler, xxii., 2, p. 248.

eventual destruction of corneal tissue might be considerably greater than it would have been had the ulcer been cauterized effectually in the beginning. It would seem the wisest course, in incipient corneal ulcer, first to make cover-glass preparations of scrapings of the ulcer, and then, if lance-shaped diplococci staining by Gram's method are found in quantities, to cauterize the entire ulcer thoroughly and strive to prevent reinfection.

Supplementary Note.

Since this case was observed a routine examination has been made of scrapings from all the corneal ulcers that have come under my notice. The diplococcus lanceolatus, or pneumococcus of Fraenkel, has been found in the virulent ulcers. In the milder cases usually no micro-organisms were found in any number, even with repeated examinations. In one shallow ulcer which healed rapidly the Morax-Axenfeld diplo-bacillus was found in great numbers. The Weichselbaum diplococcus intercellularis meningitidis was found once. A tack penetrated the cornea and injured the lens, bringing about iritis and hypopyon. The corneal wound which was slightly infiltrated when first seen on the third day was scraped and sterilized. Examination of the scraping revealed great numbers of the Weichselbaum diplococcus, many of them arranged in the characteristic tetrads. They did not stain by Gram. On the following day a second scraping was done and an agar tube inoculated. The infiltration had almost disappeared at this time, and the tube remained sterile. The inflammatory symptoms subsided very quickly. Since the diplococcus is a frequent cause of meningitis in New York, it is probable metastatic ophthalmia after meningitis will here be found to be due to this diplococcus rather than to the lanceolatus.

Explanation of the figures on Text-Plate II.

FIG. 1—A diagram of a section through the anterior segment of the eye passing through the ulcer a short distance from its centre. The black markings in the cornea represent colonies of pneumococci. × 8.

FIG. 2.—A drawing of a section through the inferior half of the anterior segment of the eye. A. The sloughing margin of the ulcer. B. Colonies of pneumococci. C. Episcleral and conjunctival vessels. D. Hypopyon. Hematoxylin-eosin. × 25.

FIG. 3.—Interlamellar lymph spaces with spreading colonies of pneumococci. To the right a number of leucocytes. Nissl-eosin stain. Leitz imm. $\frac{1}{12}$, ocular 1, drawing reduced $\frac{1}{3}$.

A CASE OF FAVUS OF THE EYELID.[1]

By E. LIBMAN, New York.

AS is well known, favus occurs most commonly on the scalp, and such cases are not infrequently seen with coincident involvement of other parts of the cutaneous surface. Cases of favus of the skin, without any involvement of the scalp, are unusual. In all, there are fifty-one of the latter class of cases. In the large majority of these cases, the disease occurred in the skin of the trunk, or the extremities. Five cases of involvement of the scrotum are reported, and two, in which the glaus penis was attacked.

The rarity of the occurrence of favus of the eyelid is evidenced by the fact that there are but two such cases on record. One case was reported by Schiess-Gemuseus (*Monatsblätter für Augenheilkunde*, xi., Juli-Aug. 1873), as occurring in the upper eyelid of a girl, thirteen years old; the ciliæ were not involved. The second case is cited by Pick (*Archiv für Derm. und Syph.* 1891—*Ergänzungsheft*). In this case the favus occurred in the right upper eyelid of a young man, who acquired the disease through the habit of having a cat, similarly diseased, sleep on his face, the favus patch of the cat being in contact with his eyelids. Pick states that there had been no herpetic initial stage, which is usually present when favus attacks the skin of the trunk or extremities. As to its occurrence, or absence, in our case, nothing can be stated, as the case came under observation with the disease fully developed.

[1] From the Pædiatric Clinic of Dr. Koplik, at the Good Samaritan Dispensary.

The case which we desire to report, is that of a boy, eight years old, whose previous history is irrelevant. When first seen, there was, on his left upper eyelid, at the centre of the margin, a typical yellow favus scutulum, about one quarter inch in diameter. The lid for a short distance on either side presented the appearance of a marginal blepharitis. The scutulum had first been noted by the mother, three weeks before. The boy complained of no pain nor discomfort, except for the increased lachrymal secretion. Etiologically, nothing could be established.

On removing the scutulum, a red, moist, slightly depressed surface was seen. Microscopical examination of the scutulum showed the mycelium and the conidia in large numbers, and the same were grown on agar at 30° C. The treatment consisted in epilation, and the use of unguentum hydrargyri oxidi rubrum. The ciliæ removed showed the mycelium and conidia in the hair-sheaths and shafts, distributed in the way Kaposi has pictured them in the hair of the scalp.

After a few days, the lid presented no traces of the favus, except a slight depression, where the scutulum had been. The picture was that of the ordinary blepharitis, and it is easy to see how such a case could go unrecognized and become a source of infection, especially if the scutulum were picked off by the child. What would lead one to suspect something different from an ordinary marginal blepharitis, was the fact that only the centre of one lid was inflamed.

After eight weeks, neither mycelium nor conidia could be found, and nothing was left of the lesion but a slight redness.

In conclusion, I desire to thank Dr. Koplik for having allowed me to use the case for publication.

THE NECESSITY OF A FIXED ROUTINE OF PROCEDURE IN THE HYPODERMIC USE OF PILOCARPIN.[1]

By G. HERBERT BURNHAM, M.D., Toronto,

F.R.C.S., EDIN., M.R.C.S., ENG., ASSO. PROF. OPHTHALMOLOGY AND OTOLOGY, TORONTO UNIVERSITY.

AT the meeting of the British Medical Association held this summer in Montreal, I read a paper entitled "The hypodermic use of pilocarpin alone, and associated with other medicines, in the treatment of certain affections of the eye."

In the discussion that ensued I was for the first time made aware of the absence on the part of any of those discussing the paper, of a prescribed and inviolable routine with respect to the hypodermic use of pilocarpin. The great necessity of a fixed routine, such as I shall outline, has been forced upon my mind as the result of more than seven years of carefully directed attention to the action of this drug. I had prior to this time used it, but in the desultory and forlorn-hope spirit which was then the rule, and is to-day by far too prevalent in the minds of the profession.

It is a medicine, either alone or combined with other medicines of such a nature as the disease may require, which has very great *possibilities* indeed. These great possibilities are not confined to the eye; but are equally applicable to any other part or organ that may be diseased. At present I have under my care a man in whose case my routine is as follows:

My first group of injections was ten in number. I gave them every day. My rule is to give the injections daily. The number of each group varies from six to twenty-one. While in use the pilocarpin is given every day unless there be nausea, headache,

[1] (Read before the Toronto Medical Society, Dec. 16, 1897.)

or oppression over the region of the heart, when it is stopped for one or two days, or perhaps the dose reduced only. I never give any stimulant whatsoever, either before or after the injection. It might be necessary to order a stimulant when the patient showed a peculiarity only found out after giving the drug; but its daily use during a group of injections is, I consider, a proof that the medicine is wrongly administered.

The largest group is the first. As a rule, the later ones vary from six to ten. Under conditions which show great tolerance, I might go to fourteen.

The temperature of the room should be about 75° Faht. Flannel sheets are put on the bed with the ordinary amount of additional bedclothes only. The patient, clad in a flannel suit of under-clothing, lies fully or partly on his side, having a moderate-sized pillow under his head. In his hand is a mug to catch the saliva. The bedclothes are well tucked in about his body. No draughts of air are allowed in the room. He then gives me his arm, and into the forearm I inject the solution. The arm is again put under the clothes, which latter are put up well about his neck.

Profuse perspiration of the whole body, with a markedly free flow of saliva, which is spit into the mug without any change of posture, should always follow. Any less effect means that the drug has not been properly given, *i. e.*, either the dose is too small or the surroundings are wrong. He remains in bed two to three hours, as by this time the reaction has quite disappeared.

He now gets up and is wiped dry with warm towels. He then dresses and goes about the house, but must not go out of doors. He now takes his evening meal, eating in moderation, as often the appetite is too good to be freely indulged. This man goes to his work the next day, and only returns home in the afternoon just before the hour for giving an injection, which is 5.30 o'clock. This is daily repeated till the number is finished. The interval between the groups varies from three to eight weeks. After having used the pilocarpin for several months, I may lengthen the interval to eight weeks. This latter limit must not be exceeded; for if it be, then, though there may be no relapse or loss, still there is no further improvement. This I have proved clinically in the case of a patient who was given these injections continuously for four years. During one year, the third, he came only four times, with the result that the eyes, which had previously steadily improved, came to a standstill. They held their own, it is true, but

did not improve. The fourth year, however, he implicitly obeyed my directions, with a decided improvement of the eyes.

Pilocarpin has such a strong and direct action upon the nerve centres influencing the absorbent processes that they are rendered both very active and also exceedingly sensitive to external and internal impressions. That is, I have seen the patient, while under the influence of the drug, affected injuriously by causes such as want of quietness or by a draught of air, which could only be felt by nerve centres most acutely sensitive. A patient may say he feels a little chilly, as if air were blowing about his shoulders, in a room of 75° Faht., with apparently no draught of air to be felt. By reaching over and tucking in afresh the bed-clothes this at once passes away. Sometimes there is a tremor over the whole body, which is purely nervous, short-lived, and of no importance. If a patient complain of cold feet, then apply heat to the feet. I now, as a rule, have a hot bottle put each time to the feet, as it seems safer, in that cold feet act injuriously, like a draught of air, upon the highly stimulated nerve centres.

The strength of my solution is 5 gr. ad ʒ i. The dose varies from gr. $\frac{1}{12}$ to gr. $\frac{1}{4}$. By giving so little fluid with each injection and by always dipping the needle into a lotion of carbolic acid, 1 in 20, I am able to use the same forearm for the whole group with scarcely any perceptible soreness. Some say they give as much as gr. i. at one injection. This I do not understand, and I am quite certain I should never dare to give so large a dose. In one of my cases I thought I gave gr. $\frac{1}{2}$—that in my opinion was an error; for my syringe leaked and through underestimating the quantity, I think, arose my error. If the syringe leak only apparently a very little, it is impossible correctly to gauge the amount lost. This is my experience. The syringe I now use always gives a perfectly dry condition all about the puncture and thus I can accurately estimate the dose. This may be one reason of the large doses said to have been given. Another reason may be that by the use of alcohol just prior to the administration of the injection an unusual power of resistance may be given. This latter procedure, however, I look upon as most decidedly non-physiological, and to have been adopted so as to counteract the effect of too large doses of the medicine.

Another rule is that in order to get the best results it is necessary to continue its use as long as there is any improvement, even to four years or longer.

In this way only can the maximum effect be attained. One cause at least of the beneficial action of pilocarpin is the power of arousing very greatly increased physiological activity.

The apparent inertness, or the very limited effect, in many cases of medicines, as for example iodide of potash and mercury, may be due to the inability to arouse this increased physiological activity. As soon, however, as a medicine is added which can do this, then immediate good results follow. This further shows why pilocarpin in order to get its best results should always be used associated with other medicines suitable to the disease, for then it shows in the most marked manner its great value, its true position among medicines.

It is another reason for the necessity of persistence in its use and also method. As a rule I test the vision just prior to giving another course of injections.

In my opinion pilocarpin can only be persistently used, alarming symptoms can only be avoided, and the best results can only be reached by most methodically following out in every minute particular a routine similar to the one I have laid down as my own.

SUCCESSFUL REMOVAL OF A LARGE PIECE OF STEEL WITH HAAB'S ELECTRO-MAGNET —DELIRIUM TREMENS—DEATH.

REPORTED BY A. BARKAN, M.D., SAN FRANCISCO, CAL.

On the 18th of December, 1897, D. G., about twenty-eight years of age, employed in the boiler-shops of the Union Iron Works, San Francisco, was struck in the left eye by a piece of steel from a hammer. A few hours later I found a gaping wound in the outer half of the sclerotic two-thirds of a centimetre from the corneo-scleral margin, slightly below the horizontal meridian; a few drops of vitreous were escaping; anterior chamber, iris, and pupil normal; no fundus visible; in the vitreous copious hemorrhage, probably retinal detachment. Projection of light faulty from above; fingers dimly seen in lower half of field; the patient not suffering pain, but considerably under the influence of whiskey.

There could be no doubt of the presence and large size of the foreign body within the eye; the wound was slightly enlarged with scissors, to avoid any additional injury to the eye and secure smooth removal of the foreign body, the patient being in a painfully excited condition.

Haab's electro-magnet was applied within one-quarter of an inch from the wound; the patient felt a sharp pain for a second, and we were all relieved by seeing the big chip of metal (size 7 x 3 *mm*, weight 48 *mg*) adhering to the pole of the magnet. Bandage and rest in Lane Hospital. Under the ordinary treatment patient did well. A bottle of whiskey was found in his possession and removed the day after admission to the hospital. Wound healed promptly; projection improved; motions of the hand were recognized, but patient was very excited and had to be watched. Three days after admission acute delirium tremens in its most severe form broke out. Morphine, bromide, chloral, and injections of

strychnine had no effect whatever. Within thirty-six hours the patient succumbed rather rapidly half an hour after an injection of one-tenth grain of strychnine. No post-mortem was made.

The foreign body was by far the largest of five removed by Haab's magnet within one year, and the case, though it ended fatally, the patient having been a heavy drinker for years, must be put to the credit of Haab's magnet, for the removal was speedily and smoothly accomplished through the original wound, and some vision might have finally been restored.

P. S. In a recent letter Prof. Haab makes the following statement, which will be of interest and use to those who work with his admirable instrument, and to the publication of which, therefore, I am sure he will not object:

"*I continue,*" *he says,* "*to be well satisfied with the use of my instrument, and have, during the past six months—the last time but a few days ago—made very successful extractions with it. The last operation demonstrated to me that even when the metallic chip has entered the eye laterally from the cornea, through the ciliary body, it is better to draw the same around the lens into the anterior chamber, as it is especially difficult, for a small chip at least, to find its way through the ciliary body. If once firmly entangled near the channel of entrance, it would be hard to extract it. The last one landed safely in the anterior chamber, and was extracted from there, also with the large magnet, by help of a small corneal incision.*"

In my last case, the large foreign body came out smoothly, though in the region of the ciliary body.

SUTURE OF THE CORNEA AFTER REMOVAL OF THE LENS.

AN EXPERIMENTAL STUDY.[1]

By W. H. BATES, M.D., New York.

(*With six figures in the text and three on Text-Plate III. facing p.* 186.)

As most of the failures in cataract extraction in recent years are in one way or another due to the lack of control of the opening in the cornea during the operation, or to its accidental opening afterwards, the use of the suture has naturally suggested itself to surgeons, some of whom have reported encouraging results.

The suture has not been generally adopted, and as improvement in the cataract operation is desirable, it seemed to me important that an experimental study should be made on animals so as to learn definitely the limitations and advantages of the suture, if it possesses such, to the end that it may be made available if of value, or if impracticable or useless this may be finally determined so that improvement may be sought through other means.

The following paper, which embodies the results of my studies in this direction, falls naturally into the following related themes.

1. A sketch of work done by previous observers on the human eye.

2. A comparison of cataract operations on the rabbit's eye with that on the human eye.

[1] The work was done in the Department of Pathology at the College of Physicians and Surgeons, Columbia University.

3. A description of the method of the introduction of the suture in operations on the rabbit.

4. The number of sutures required to close the wound.

5. The length of time the sutures should remain in position.

6. An estimate of the value of the suture based upon the experimental study,

(*a*) In closing the wound,

(*b*) In controlling prolapse of the iris,

(*c*) In returning prolapse of the vitreous,

(*d*) In controlling intraocular hemorrhage.

7. Conclusions.

1. A SKETCH OF WORK DONE BY PREVIOUS OBSERVERS ON THE HUMAN EYE.

Dr. H. W. Williams,[1] of Boston, was the first operator to practise suture of the cornea after cataract extraction in man. He reported forty-eight cases in 1867 with 4 per cent. of iris prolapse and no case of suppuration. His needle was 6 *mm* long with flat cutting points. It was held with forceps. The suture consisted of a single strand of fine silk. This was inserted after the removal of the lens. It did not enter the anterior chamber, but passed through the superficial edges of the incision. See Fig. 1.

FIG. 1.—Diagram of the suture of H. W. Williams.

He advocated the removal of the suture in a week or less. He claimed that he had fewer accidents at the time of the operation and better healing of the wound than when the suture was not used. In a communication two years later,[1a] he adds to the description of his method the following:—"At present I am disposed to extend the corneal flap at its apex a little way into the conjunctiva, so as to allow of the

placing of the suture in this membrane, where it is more readily inserted than through the tougher corneal tissue."

Dr. F. Suarez de Mendoza,[2] in 1892, reported thirty-eight cases in which the suture was used. He had reported the first of these cases several years earlier. His method differed from that of Williams. A shallow preliminary incision of the cornea was first made at the upper part of the proposed wound. Then a small needle was introduced 2 *mm* below the incision and drawn through its lower edge. The needle was then made to pass through the upper edge of the incision. See Fig. 2.

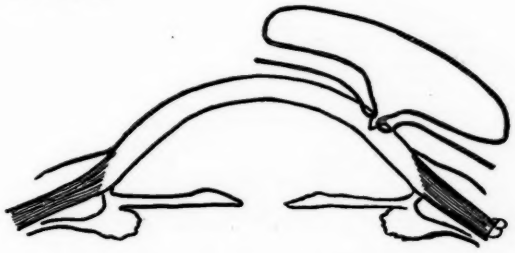

FIG. 2.—Diagram of the suture of de Mendoza.

A loop of the thread was left and placed on one side. The section of the cornea was then made, the knife coming out above between the threads. He reports results better than in the operation without the suture.

Dr. E. Kalt,[3] in 1894, reported fifty cases of cataract operation in which the suture had been used with 4 per cent. of iris prolapse—the same percentage as that of H. W. Williams. Kalt introduced his suture in the superficial layers of the cornea before the section was made, and without the shallow preliminary incision of de Mendoza, having one thread pass in and out of the superficial layers of the cornea below the proposed section, and the upper thread in the same manner above. See Fig. 3.

A loop was left to allow room for the section and for the removal of the lens. Kalt claimed to be able with the suture to prevent loss of vitreous, and to secure the replacement of a prolapsed iris after tying the suture, results which

without the suture he could not accomplish in a number of cases.

Dr. Charles H. Williams,[4] of Boston, in 1896 reported eleven cases. He introduced the suture, which only included the conjunctiva, after the removal of the lens. See Fig. 4.

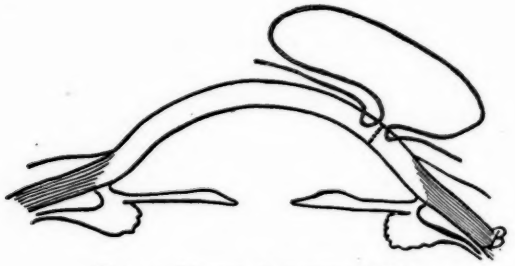

FIG. 3.—Diagram of the suture of Kalt.

FIG. 4.—Diagram of the suture of C. H. Williams.

His section was made with a conjunctival flap. He in some cases used three sutures. Prolapse of the iris occurred, but much less frequently than without the suture.

Chisolm[5] operated on one case with the suture with a favorable result.

Vacher[6] had an unsatisfactory experience with the suture. Other operators have tried the suture in a few cases, but have not used it as a routine practice in their operations for cataract extraction.

It was in view of the improvement in the operation of cataract extraction in man which the suture seemed to offer that these experiments on the rabbit were undertaken, in order more accurately to determine its limitations and value, and the conditions for its successful practice. Seventy-eight

eyes were used in the experiments. The eyes were finally enucleated in order to make a complete study in microscopical sections. The present article includes only the experiments upon the suture. During its preparation, the changes which occur in the anterior segment of the eye at the time of operation and in the process of healing, the causes of secondary cataract, corneal astigmatism, and displacement of the pupil were also studied. The microscopical examination of eyes at the time of operation and during the healing process revealed causes of failure which have not been hitherto described, and suggested other improvements than the suture in the technique of cataract extraction, which I purpose to publish in a subsequent article.

2. A COMPARISON OF CATARACT OPERATION ON THE RABBIT'S EYE WITH THAT ON THE HUMAN EYE.

The rabbit's eye is not as favorable for operation as is the human eye, for the following reasons: (1) It is difficult, on account of its delicacy, to steady the eye of the rabbit by grasping the conjunctiva with fixation forceps—the forceps usually tearing through it. (2) The average thickness of the rabbit's cornea is 0.15 *mm*, while that of the human cornea is 1 *mm*—the rabbit's cornea being so thin that it collapses as soon as the puncture is made, so that the section is completed with difficulty. (3) The wound always gapes and the iris prolapses as soon as the section is completed; moreover, the iris cannot be returned by the use of instruments, syringing, or even after a small iridectomy, as is possible in man. (4) There is more fibrin found in the rabbit's eye than in that of man, which increases the difficulty of the operation.

In addition to these difficulties in the operation it is impossible to give the rabbit's eye the same care during the healing process. The bandage cannot readily be used. In eight cases in which bandaging was tried, the rabbits tore the bandage off soon after recovery from the ether. They were observed to rub the operated eye with their paws, and scratch it with their hind feet, with sufficient force in three cases to cause rupture of the globe. The attempt to secure asepsis was not made in these operations on the rabbit.

3. A DESCRIPTION OF THE METHOD OF INTRODUCTION OF THE SUTURE IN OPERATION ON THE RABBIT.

The methods of introduction of the suture in man employed by H. W. Williams, de Mendoza, Kalt, and C. H. Williams, were all tried, but with none was the closure of the wound in the rabbit successful. They were all superficial sutures. To understand why such sutures did not close the wound, a microscopic study of sections of the eye enucleated immediately after the operation was necessary. Such a section is shown in Fig. 5, Text-Plate III., which represents a section of the rabbit's eye (immediately after the operation) in the region of the wound. The incurvation of the lower flap is shown. The cornea is curved inwards along the line of incision so that the cut surface of the wound is in contact with the iris. A superficial suture, although it brings the anterior layers in contact, does not approximate the divided ends of the posterior limiting membrane. See Fig. 6, Text-Plate III. This figure is a diagram showing the effect of a superficial suture in closing the wound of a rabbit's cornea. The relative size of the suture to the cornea is shown. The iris is always incarcerated. In ten cases in which it was employed it had to be removed and a suture which included all the corneal layers inserted. Fig. 7, Text-Plate III., shows the effect of a suture which includes all the corneal layers. The eye was enucleated immediately after the operation. The suture and iris are diagrammatic.

In Fig. 8 is shown the proposed method of inserting the suture in the human eye.

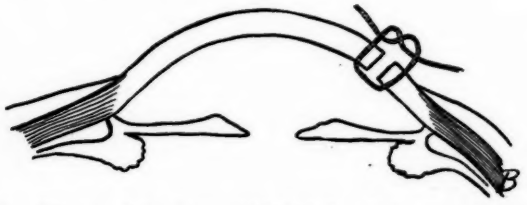

Fig. 8.—Diagram of the suture which includes all the corneal layers in the human eye. The relative size of the thread to the human cornea is shown.

It was found best to insert the first suture after the sec-

Illustrating Dr. Bates' Paper.

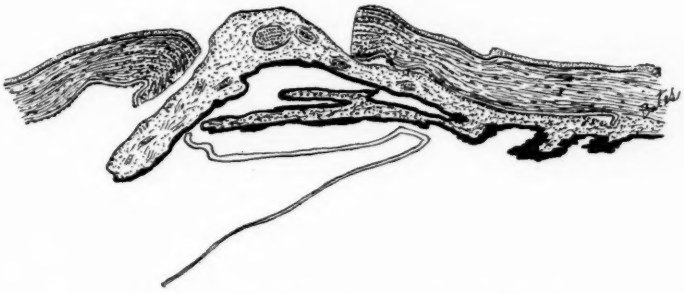

Fig. 5.—Unsutured section of cornea with prolapse of iris.

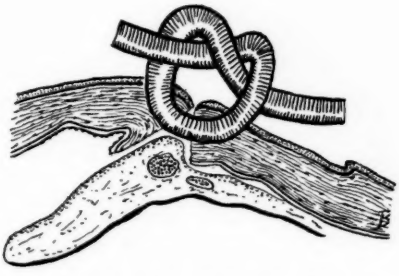

Fig. 6.—Section of cornea with superficial suture and incarceration of iris.

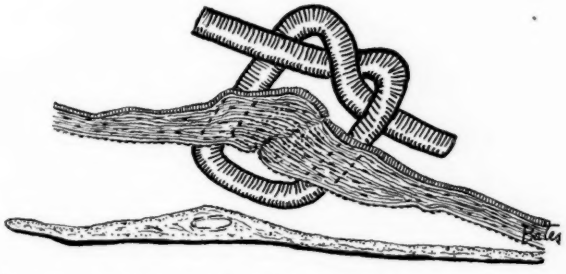

Fig. 7.—Section of cornea with suture including all the layers and producing complete coaptation.

tion was made and before the removal of the lens, a loop being left after the method of de Mendoza and Kalt for the passage of the lens. If the suture was inserted after the removal of the lens, loss of vitreous could not always be avoided.

A curved needle 12 *mm* long was used with a Sands needle holder. The thread was black silk No. 000. After the section was made, the lower edge of the wound was separated from the iris with a small blunt hook. It was grasped with straight mouse-toothed iris forceps and the needle passed from without inwards close to the edge of the wound and through all the layers of the cornea, the endeavor being made to have the point of the needle emerge on the inside opposite the external entrance. The thread was pulled through, and the hook was passed between the iris and thread from side to side to determine whether the iris were caught. The needle was then passed from within outwards as before through the scleral side of the wound, and the thread pulled through. The hook was used again to detect inclusion of the iris in the suture. If the iris was caught by the needle this could often be seen, when it could be freed by withdrawing the needle slightly. In some cases the fact that the iris was penetrated by the needle was shown by hemorrhage. When the iris was accidentally included in the suture, the thread was removed and reintroduced through the same opening in the cornea (which is easier to do than it would seem). The opening made by the needle is much larger than is necessary for the passage of the thread, and it is further enlarged by the cutting of the thread. The opening cannot be seen, but the point of the needle slips into it by feeling in the neighborhood.

To avoid lateral sliding of the flap, it is necessary to insert the suture at opposite points in the wound. To do this, the needle should be held on a line with the centre of the cornea when introduced through the lower lip of the wound, and kept on this line over the lower insertion when penetrating the opposite point in the upper lip of the wound.

After the knot has been tied, the thread may partially cut through the cornea, from traction produced by inserting

other sutures, or from traumatism, thus allowing the edges of the wound to separate. When this occurs, the suture should be removed and a new one introduced in its place.

In most cases the first part of the knot should be made with a double turn to prevent slipping. If there be considerable fibrin in the wound, it adheres to the suture and interferes materially with drawing the knot tight. In such a case a single turn of the thread is sufficient to prevent the first knot from slipping. The second knot should not be tied until after all the sutures have been inserted.

It is essential to secure perfect coaptation of the lips of the wound at the time of the operation. If perfect apposition is not secured, the presence of the iris in the wound excites so much irritation that the intraocular tension is increased sufficiently to cause still further separation, and the sutures may cut through in less than three days (experiments with fifteen cases).

Briefly stated, the method which I have employed in the rabbit differs from others which have been used in man in that the first suture is inserted after the section is made and before the removal of the lens; in that it includes all the layers of the cornea; and in that after the lens is removed a sufficient number of sutures are inserted to bring the lips of the wound into *perfect* apposition. By this method the dangers from the introduction of the sutures are slight. Before the lens is removed, the insertion of the first suture is attended with little risk. After this suture is in position the eye is under control, and the necessary number of sutures can be inserted after the removal of the lens without the risk of serious accidents.

4. THE NUMBER OF SUTURES REQUIRED TO CLOSE THE WOUND.

The number of sutures necessary in the rabbit to close the wound and retain the prolapsed iris in the anterior chamber depends upon the degree of congestion. If the congestion is considerable, the amount of fibrin large, and the wound gapes from intraocular tension, more sutures are necessary than when these conditions are absent. In some

cases three sutures closed the wound. The greatest number used was ten. When the operation is complicated by accidents, such as irregular section, injury of the iris, or loss of vitreous, more sutures are necessary, because there follows an increase of intraocular tension from congestion which separates the lips of the wound. The wound can always be closed when a sufficient number of sutures is used. In no case was the wound properly closed by one suture.

5. THE LENGTH OF TIME THE SUTURES SHOULD REMAIN IN POSITION.

In most cases the sutures are not needed after three days. The wound unites early and the sutures become unnecessary. But they were allowed to remain fourteen days in ten cases without apparent harm.

6. VALUE OF THE SUTURE.

(a) *In closing the wound.*

The suture was found to secure complete closure of the wound in all cases. A variety of sections were made in order to test the efficiency of the suture under various conditions. In Fig. 9 are shown diagrammatically a number of the sections made which were closed by sutures.

The operation was complicated, either accidentally or by design, by loss of vitreous, intraocular hemorrhage, and wounds of the iris and ciliary body, and the sutures closed the wound. The efficiency of the suture in keeping the wound closed was severely tested by the following experiments:

(1) In 6 cases the fine tip of a lachrymal syringe was inserted between the sutures, and the anterior chamber filled with $\frac{3}{4}$ per cent. salt solution, until the intraocular tension was $+3$. The fact that the water did not flow out showed strikingly the ability of the sutures to keep the wound closed.

(2) When the anterior chamber was evacuated by forcibly opening the wound between the sutures, the iris was not forced out with the gush of fluid, which so commonly occurs when the suture is not used. The anterior chamber was refilled, evacuated, and filled again, with the same result.

(3) With the syringe, air was forced into the anterior chamber until the tension was +3. It remained three days, when it was absorbed.

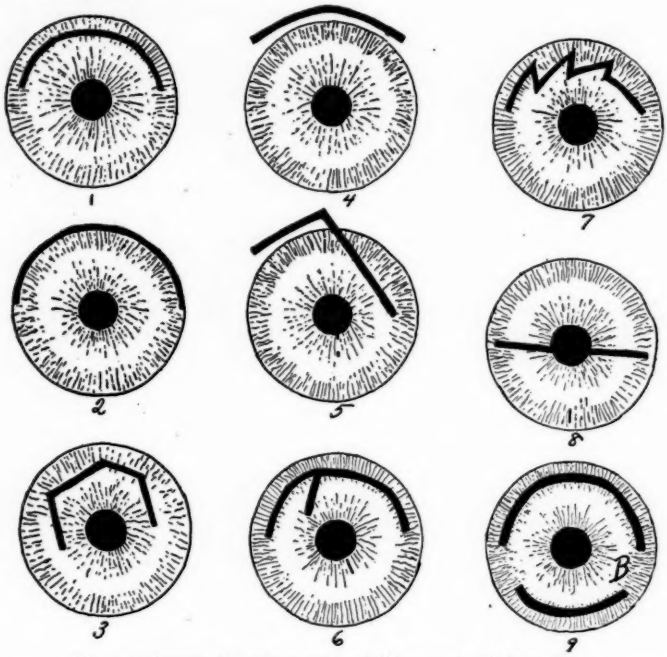

Fig. 9. Diagram of sections made which were closed by sutures.
1. Corneal section.
2. Sclero-corneal section.
3. Irregular angular section.
4. Scleral section.
5. Section partly in sclera and partly in cornea.
6. Bifurcated section.
7. Jagged section.
8. Transverse corneal section.
9. Section of cornea above and below.

(4) In 50 cases the eyeball was pulled in various directions by traction on the suture without reopening the wound.

After the preceding experiments, healing followed by primary union.

(5) The severest test occurred in 3 cases, in which the rabbits ruptured the eyeball without the tearing out of the sutures.

(*b*) *Value of the suture in controlling prolapse of the iris.*

All the rabbits' eyes at the time of the operation had incarceration or prolapse of the iris, which was not corrected by the use of instruments, syringing, or a small iridectomy. The suture was necessary to return the iris.

(*c*) *Value of the suture in returning prolapse of the vitreous.*

No other method is known by which prolapse of normal vitreous can be returned. It is accomplished by upward traction on the lower thread of the first and central suture, thus closing the wound. One can regulate the amount of prolapse, stop it at any moment, cause it to recede, come again, or disappear suddenly, all by manipulating the lower thread of the suture, by which the wound may be opened or closed at will.

(*d*) *Value of the suture in controlling intraocular hemorrhage.*

The suture, by closing the wound, controls intraocular hemorrhage. This fact was discovered accidentally in a rabbit on which the usual extraction was being performed. The hemorrhage was very profuse, and was not controlled by a pressure bandage. The rabbit lost so much blood before the suture was applied that it died two hours later. The suture stopped the hemorrhage at once. Later experiments confirmed the original observation that by traction on the lower thread, closing the wound, the hemorrhage could be stopped. It could be excited again by reopening the wound, and again stopped by traction upwards on the lower thread. I have seen five cases of intraocular hemorrhage in man which were not controlled by a bandage. The patients suffered great pain, which was only relieved by enucleation. The value of the suture was so unquestioned, so prompt in controlling intraocular hemorrhage in the rabbit, that the suture was inserted in all the succeeding cases before the removal of the lens in order to prevent hemorrhage.

Summary.—In a series of experiments made upon seventy-

eight eyes in the rabbit, with a view of testing the safety and efficiency of the suture of the wound in cataract operation, it was found that by a modification of the methods hitherto practised, loss of the vitreous and intraocular hemorrhage could be prevented, the wound could be readily and firmly closed, and the prolapsed iris could be returned to the anterior chamber, and this without aseptic treatment. Primary healing occurred in 80 per cent. of the cases, with a clear, circular, and nearly central pupil.

7. CONCLUSION.—Inasmuch as the operation for the removal of the lens, although similar in the rabbit, is more difficult than the same operation in the human subject, the conclusion appears to be justified that the use of sutures to close the wound in the operation for the removal of the lens in man is a valuable improvement in the technique of cataract extraction.

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SOME REMARKS UPON PHYSIOLOGICAL DIPLOPIA AT A DISTANCE AT THE PERIPHERY OF THE FIELD.

By JOHN DUNN, M.D., Richmond, Va.

LIEBRECHT (Archiv. of Oph., vol. xxvi., No. iv.) thus sums up the individual characters of physiological diplopia:

I. *In almost all men the presence of double images* in certain directions of the gaze can be demonstrated by suitable tests. Such diplopia *never occurs spontaneously* when the eyes are being used in the natural way.

II. Such diplopia never occurs when the gaze is directed straight forward, but only *when the eyes are rotated*—and generally when they are rotated very far in the different directions.

III. The double images are almost always *homonymous*, and are so too for directions of the gaze up and down.

IV. *Physiological diplopia depends upon the fact* that in the associated lateral movements of the eyes the power of either eye for turning inward exceeds its power of turning outward. Such diplopia occurring in the course of movements up and down depends upon the difference shown by the two eyes in the ability to make excursions in these directions.

The following gives the results of experiments made to verify these statements of Dr. Liebrecht. So far as I. and II. are concerned, little is to be said. In the large majority of persons the presence of double images for distance at the oblique extremes of the visual field can be more or less easily demonstrated. It is only exceptionally the case that the same is true for the horizontal or vertical extremes, the overhanging brow and the prominent nose shutting off one or both images before the limits for combined muscular action

are reached, while the strong associated downward and inward movements are, as a rule, sufficient to meet any demand made upon them for single vision below. Our remarks therefore will apply to the characters of the physiological diplopia found for distance at the oblique limits of the field of fixation. While diplopia does not occur here spontaneously, we find from time to time a patient who has learned for himself that double images can be seen by turning his eyes far in the oblique directions, whether up or down.

For instance:

Mr. A., aged forty-six, while being examined to determine in his case the relative position of the double images under consideration, remarked that ever since he was a boy he had known that he could see double if he would turn his eyes to the oblique limits of his visual field. Mr. A. showed, for distance, left hyperphoria, $1\frac{1}{2}^{\circ}$ and exophoria 6°, which faulty state of the muscular equilibrium doubtless contributed to the ease with which he could produce diplopia.

Dr. Liebrecht says that "the diplopia in all cases is homonymous and, moreover, for all directions of the gaze. It is always the eye that is turned to the temporal side that is the first to give out. This predominance of the forces that act to move the eyes inward is shown, too, when the gaze is directed up and down, homonymous diplopia being always present under these conditions."

How far the results of my experiments on this point differ from those of Dr. Liebrecht may be inferred from the statement that in not one out of the first thirty-four cases examined did I find homonymous diplopia present for all four quadrants of the visual field.

Dr. Alling (ARCHIVES OF OPHTHALMOLOGY, vol. xxiv., p. 374), in an interesting article, in which his remarks are confined chiefly to physiological diplopia, complicated by the necessity for accommodation, and in which he does not go at all fully into the subject of "diplopia at a distance at the periphery of the field," says of this latter that it is "of common occurrence, and, as would be expected, insufficiencies of the interni, as a rule, show crossed diplopia of the externi,

homonymous." This statement of Dr. Alling's does not give us the rule, and as will be seen is liable to many exceptions. For example:

Miss L., aged eleven. O. D. and O. S. refraction + 1 D sph. Vision normal. Hyperphoria 0, exophoria 4°. In this case the double images are easily seen and are *homonymous for the oblique extremes of the lower quadrants, crossed for the upper.*

The next two cases examined, aged forty-nine and fifty-three, having, with the correction of slight refractive errors, normal vision, and having for distance, in one case 1° of exophoria, and in the other 1° of esophoria, no hyperphoria, abduction for each case 7°, adduction 16°, both showed *homonymous* diplopia for the *lower*, and *crossed* for the *upper* quadrants.

Mr. F., aged forty-six, exophoria 6°, hyperphoria 1½°, abduction 8°, adduction 16°, gave *crossed* diplopia for both upper and lower quadrants.

The next twelve consecutive cases, three of which showed esophoria 3°, six exophoria from 1½° to 2°, three neither exophoria nor esophoria, and none hyperphoria, all gave *homonymous* diplopia for the lower, *crossed* for the upper quadrants.

Of the next eighteen cases examined, sixteen showed crossed diplopia for the upper quadrants, homonymous for the lower; while the other two gave crossed diplopia for all four quadrants. Of the eighteen none showed more than ¼° to ½° of hyperphoria, while both of the cases giving crossed diplopia for all four quadrants had about 1½° hyperphoria with marked exophoria.

The above and further experiments on the subject seemed to give the following as the rule in regard to the physiological diplopia found for distance at the oblique extremes of the visual field: *the double images are homonymous for the lower quadrants, crossed for the upper. Exceptions occur, but they can generally be explained by some faulty state of the muscular equilibrium.*

High degrees of esophoria, or cases showing marked convergence-excess, may, but do not always, give homonymous diplopia in both upper and lower fields, and *where they do the distance between the double images is much greater below than above.* For example:

Miss T., aged twenty, V normal, refraction + 1 D sph. O. D.

and O. S., abduction less than 1° (patient showed with red glass before one eye 5° of esophoria), adduction 20° +, esophoria 6°, hyperphoria 0°, gave homonymous diplopia for both upper and lower quadrants; but she voluntarily remarked, "The two lights are very much nearer together above than they were below."

High degrees of exophoria, or cases showing marked divergence-excess, may, but do not always, give crossed images for all four quadrants. The rule, however, is, I think, fairly stated above, and the explanation would seem to be as follows: When one looks down and to the right, for example, the left eye brings into play the strongest of the combined muscular movements, viz., that produced by the superior oblique and inferior rectus assisted by the internal rectus. The resulting *homonymous* diplopia, when the extreme limit for this direction of the field of fixation is reached and just passed, shows that this combination is stronger than that produced by the combined actions of the inferior rectus and superior oblique, assisted by the external rectus plus the angular advantage the right eye has in that it is nearer the object looked at. So, too, when we look up and to the right, the left eye brings into play the inferior oblique and superior rectus, assisted by the internal rectus, a muscular combination which the *crossed* diplopia, which develops at the limit of the combined field of fixation, shows to be weaker than that of the superior rectus and inferior oblique, assisted by the external rectus plus the angular advantage which nearness to the object gives. We must bear in mind, also, that the down and in movement is doubly innervated and made use of, not only for down and out movements of the opposite eye, but also for down and in movements, whereas the down and out movement is used only in a single combination and far less than the movement down and in, even though this combination allows monocular vision at times when binocular vision is no longer possible because of the projecting nose.

In regard to the up and in movement, although it is also under the care of a double innervation, it is much less used than the down and in movement, and the eye is rarely car-

ried, for common purposes, to the limit of muscular contraction in this direction, the brow and the nose shutting out the view before the limit is reached; while for the up and out movement the eye is more frequently used to the limit of muscular force, and can serve the purposes of monocular vision where binocular vision is not possible, because, as just remarked, of the projecting brow and nose.

In considering the associated movements of the two eyes, we must bear constantly in mind that we have not to do in either eye with the action of one muscle alone, but of a combination, and the resulting position of the eyeball, at any given time, must not be referred to the action of one particular muscle, but to the combined efforts of three restricted by three others. Of the three active muscles, the relative amount of work of each in any direction varies with the position of the ball, and this point should not be forgotten when we are considering the apparent anomalies of position in the sort of diplopia now under consideration, for by bearing it in mind we shall often be able to determine in a given case which of the three muscles is the first to give out, and thus cause the double images, and we shall be able to explain, moreover, their relative positions.

In a large proportion of the cases examined, beside the lateral, some additional displacement of one of the images was present. One image would be nearer than the other, or one on a higher plane than the other. Just at and just beyond the limit for single vision, at the moment of appearance of the double images, their relative positions may be anything, and the changes in these positions, as the patient looks at the lights, show that the muscular movements of the two eyes are not being made use of normally. If now the angle at which the light is viewed be made slightly greater, the character of the diplopia will be found, I think, to be as above stated. It is not the purpose of the present article to consider these peculiarities.

To make the experiments upon which this article is based, the writer had put on the wall of his office four gas-jets at the corners of a parallelogram, whose sides are about six and ten feet respectively, the lower jets being about one foot

from the floor. In this manner the movements of the patient's head could be regulated by the examiner, and the limits of the visual field for each eye, as restricted by the shape of nose and brow, the more accurately seen. A piece of red glass four by five inches was used to cover one eye, for without its use the double images were discernible only in a few instances.

REPORT OF A CASE OF KERATO-GLOBUS.[1]

By GEO. C. HARLAN, M.D.

H. K., a well-developed man, in good health, thirty years of age, says that his sight has never been perfect, and thinks that it is not so good now as in boyhood. There is no history of inflammation or pain.

Both corneæ are much distended and of globular form, giving a very peculiar expression to the face. They are perfectly clear throughout and their margins are sharply defined. The scleroticæ are white and firm and entirely natural in appearance, and the tension is normal.

In the right eye the horizontal diameter of the cornea is 15 millimetres and the vertical 13½. The transverse diameter of the ball at the equator, measured with a pair of probe-pointed compasses pressed well back into the cocainized conjunctival cul-de-sac, is 24 millimetres. This, of course, cannot be considered absolutely correct, as we could not see the points of contact of the instrument and had to be guided by touch, but repeated measurements gave substantially the same result. The anterior chamber is very deep. The pupil is slightly dislocated up and in and is in a plane decidedly posterior to the attached circumference of the iris. It is about two millimetres in diameter, reacts slightly to light and dilates regularly, but only to 5 millimetres, under homatropine and cocaine. The iris is tremulous and seems stretched, but is otherwise natural in appearance, and transmits no fundus reflex with the mirror.

The ophthalmoscope shows a distinct and normal fundus with no suspicion of excavation, and a highly hypermetropic refraction. Under mydriasis V = $\frac{20}{20}$ with + 6 + 1^{c} axis 180. With

[1] Read before Ophthalmological Section of the College of Physicians of Philadelphia.

the Purkingie test the three images are distinctly seen, and the presence of the lens is also evident by oblique illumination, as there is a suspicion of increased reflex and strongly marked segmentation. After subsidence of mydriasis, the same vision is obtained by $+ 4\frac{1}{2} + 1^{c}$—stronger glasses being refused. With full correction .50 D, Sn. $1\frac{1}{2}$ is read at 7″. This would represent an accommodation of $5\frac{1}{2}$ D, which cannot, however, all be credited to the lens, as the pupil is very narrow and the print rather coarse. Neither can the vision be said to be perfect, as 20 Sn. was seen under a very bright light, where a normal eye should easily decipher 16.

The left eye does not fix but is slightly divergent. The horizontal diameter of the cornea is 14.5 millimetres and the vertical 13 millimetres. The transverse diameter of the ball, measured as in the right eye, is 25 millimetres. The pupil as in the right eye, except that it is narrower and reacts less decidedly. The iris is more tremulous and is thrown into waves that can be seen several feet away on the slightest motion of the eye. In the horizontal line on the temporal side there is a fissure that has its base 3 millimetres wide at the corneal margin and terminates in a point at the sphincter. The mirror with a strong convex lens behind it reveals a number of small radiating slits in the iris, through which fine streaks of fundus reflex can be seen.

The ophthalmoscope shows a high plus refraction, and a perfectly normal fundus that can be seen equally well through the pupil or through the fissure. There are crossed double images of a candle flame fused by + 7, vision with + 7 is $\frac{8}{10}$, and there is practically no accommodation. No trace of a lens can be discovered. The field of vision is normal in the right eye, and somewhat restricted peripherally in the left.

The points of special interest in this case are the great distension of the cornea with little or no increase in the equatorial diameter of the ball, its perfect transparency and the comparative regularity of its curve; the high degree of hyperopia in spite of the extensive bulging; the good vision in the right eye; the absence of the lens in the left; and the condition of the iris in both eyes.

Usually this distension of the cornea has been found in connection with considerable increase in all the diameters of the ball with a thinned and bluish sclerotic (the typical con-

genital buphthalmos, or hydrophthalmos), more or less corneal opacity, a very much diminished vision and a high degree of myopia. Some authors state that the last is invariable. I have not been able to find any case with a record of vision equal to that in the right eye, though Fick refers briefly to two with good vision, in both of which the refraction was hypermetropic. We naturally looked to the curve of the cornea for an explanation of the refraction, and Dr. Jackson has kindly made a careful ophthalmometric measurement. He found that "the radius of curvature is about 9 *mm* (8.8 to 9.3) over an area extending 6 *mm* in every direction from the centre of the cornea. Beyond this there is a flattening similar to that in the normal cornea but less in degree." This would account for all of the hypermetropia if the axis of the ball were normal, but as it is evidently elongated a part must depend upon the lens. That this is a small one seems probable from the fact that the lens was absent in the other eye. It seems also to be the rule for the lens to be imperfect. In an elaborate paper on "Congenital Hydrophthalmos" by Dürr and Schlegtendal (*Arch. f. Ophth.*, xxxv., 2, p. 88, 1889), based on the histological examination of five enucleated eyes, the lens is described as the only part of the ball not enlarged in one, as small in a second, in a third as shrunken to a little remnant the central part of which was calcareous, in a fourth as having undergone chalky and fluid degeneration, and in the fifth as merely opaque. As in the present case the sclerotic does not seem to be distended and the axis of the ball is, therefore, increased only to the extent of the bulging of the cornea, the hypermetropia may be accounted for by the diminished curve of the latter and a low refractive power of the lens, which is also displaced backwards, as is shown by the cupping of the iris.

The iris in the right eye oscillates slightly but decidedly. This might be due to diminished size of the lens or stretching and atrophy of its suspensory ligament, though the latter supposition is hardly in accord with the accommodative power. There may be something in the suggestion of Soelberg Wells that contact of the iris with the lens is prevented by excess of fluid in the posterior chamber.

In the left eye the iris is not only without support, but is very much atrophied and shows the effect of stretching in one large and a number of smaller ruptures. As has already been noted, no signs of distension of the rest of the ball can be found, either externally or ophthalmoscopically.

Kerato-globus is a very rare affection. Many of the best text-books do not mention it, or refer to it only as an incident of buphthalmos; while others discuss it, usually very briefly, under the names of kerato-globus, cornea bulbosa, megalo-cornea, globular pellucid staphyloma, dropsy of the anterior chamber, hydrophthalmos anterior, non-inflammatory keratectasia, and pellucid spherical ectasia.

The pathology of this case is doubtful. It can hardly be classed with congenital general hydrophthalmia, or buphthalmos, concerning which much has been written. In a considerable number of histological examinations in cases of this affection, all the membranes have been found much distended and the disc cupped, and since Mauthner, in 1867 (*Die Lehre vom Glaucom*), suggested that "congenital hydrophthalmia is nothing but a glaucoma developed in utero, or soon after birth—more likely secondary than primary," and Muralt, a pupil of Horner, two years later in his inaugural dissertation, called special attention to this view of its pathology, it has generally been considered to be the result of a glaucomatic process due to uveal inflammation. There is nothing to suggest an inflammatory origin in the eyes of this patient. The only changes are in the anterior segment of the ball, and the case may be considered one of true hydrophthalmos anterior. It seems probable that the cornea in the period of its development, perhaps somewhat retarded, yielded to the pressure caused by an excessive secretion of aqueous humor, or obstruction to its outflow by incomplete separation of the iris from the cornea. In the latter case there might be a fair chance of self-limitation of the disease, as the bulging of the cornea and the stretching of the iris would tend to open up the angle of the anterior chamber.

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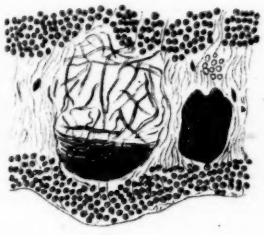

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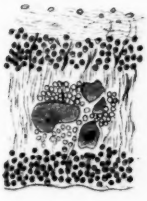

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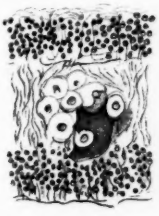

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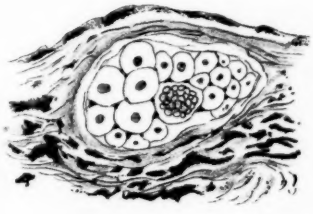

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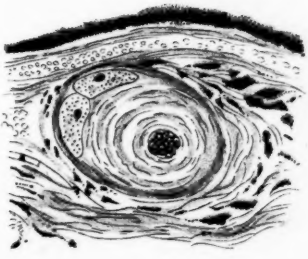

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A CASE OF RETINITIS CIRCINATA WITH ANATOMICAL EXAMINATION.

FROM THE UNIVERSITY EYE CLINIC IN ZÜRICH.

BY DR. E. AMMANN, FIRST ASSISTANT.

(With eight figures on Plate III., Vol. XXXV., German Edition, 1897.)

Translated by Dr. SELINA BLOOM, New York.

IN 1893 Fuchs[1] published twelve peculiar ophthalmoscopical cases, the common feature of which was a grayish or grayish-yellow discolored macula, surrounded by a zone of smaller or larger white plaques. In regard to the anatomical lesions in these cases, the author suggests only possibilities, being of the opinion that the white spots may possibly be similar to the coagulated masses of the albuminous transudates which occur in albuminuric retinitis. The clustered form of fatty degeneration, also, Fuchs considers to be possibly a substratum of the spots and patches.

v. Wecker,[2] when making his observations in 1894, seems to lean more toward the latter interpretation, and considers that the patches of fatty degeneration must have resulted from hemorrhage, because individual ophthalmoscopical pictures, as well as long-continued observations of the changes in hemorrhages and in white patches, convince him that hemorrhages do change to white patches. Neither he nor Fuchs has been able to follow directly, however, the change from hemorrhage to white patch.

At the last congress at Heidelberg, a discussion of the question of the anatomical lesion in retinitis circinata was brought forward by Siegrist of Basel,[3] who brought up the

case of Weltert[4] for reconsideration in regard to its clinical diagnosis. Siegrist thinks himself justified, in view of the clinical course of the case, to conclude that the white patches are rather due to more or less fluid transudates than to fatty degeneration. In the discussion Leber[5] warns against coming to such conclusions, there being no anatomical examinations upon which to base them, and mentions that in retinitis albuminurica, œdema always shows itself by a mere grayish opaqueness of the retina; white patches being a result of a deposit of fat granule-cells and free fat granules in the retinal tissue, or of amorphous exudation of albumen or fibrin, while in leukæmia, a result of an aggregation of round cells.

The cases of Holmes Spicer,[6] Hartridge,[7] and Goldzieher[8] (that is, if the changes described by Hutchinson are identical with retinitis circinata) throw no further light upon the anatomical construction of the white patches, and besides these there are, so far as I know, no cases recorded.

A peculiar accident made it possible for me to examine, anatomically, a case which had been under my observation a long time.

F. H., sixty-six years old, had been under observation in the clinic for nine years. Patient presented himself in 1887 for the first time for treatment, having acute glaucoma of the left eye, upon which iridectomy was performed on May 7th of the same year. Sight, left: Movements of the hands before the eyes; June 2d, left amaurosis. Sight, right: $\frac{1}{2}$. Ophthalmoscopically, right: beginning glaucomatous excavation; tension normal.

In 1895 patient presented himself with a new change in the right eye, consisting of several small white patches in the region of the macula, and two small hemorrhages between macula and papilla. The latter shows no excavation.

One month later (October, 1895), both hemorrhages are still to be seen at the same place. To the temporal side of the papilla there are a number of white shining patches, which however do not form a star-shaped figure. In the urine a trace of albumen. Sight, right: $\frac{1}{2}$.

December 7th.—The patient presents himself again, this time with acute glaucoma of the right eye.

December 9th.—Iridectomy.

December 31, 1895.—Tension at the highest normal border. Cornea somewhat dull; in the urine not a trace of albumen. During the following week the tension remains normal under the influence of eserine (3 drops daily); only in the morning it is occasionally slightly increased. Sight, right: $\frac{6}{60}$.

The configuration of the white patches, as shown in Fig. 1, appeared at first on January 11, 1896. The macula showed a slight gray discoloration, and was surrounded by shining white spots, which had coalesced to a larger patch under the vena temp. sup. A small hemorrhage could be seen on one side of the superior veins. The two hemorrhages to the temporal side of the papilla had disappeared. In the urine again a trace of albumen.

March 5, 1896.—Right: Again an acute glaucomatous attack, cut short by eserine.

March 23, 1896.—Several fresh hemorrhages on the vena temp. sup. in the region of the macula, above the white patches.

April 1st.—Right. Sclerotomy.

April 17th.—Right. Tension normal. Still more new hemorrhages on the vena temp. sup.

April 27th.—The white patches have run together to form larger plaques, which now lie to the nasal side of and above the macula.

August 12th.—The patches present the picture shown in Fig. 2.

August 28th.—The changes in the macula remain the same. In other parts of the fundus, there are quite a number of larger hemorrhages to be seen.

Patient collapsed, suddenly, during ophthalmoscopical examination and died immediately afterward. Post mortem not permitted, but 8 hours after death, permission to enucleate was granted.

The clinical picture of the retinal lesion in this case is identical with that described by Fuchs. The appearance of the white wreath was perfectly typical in the beginning, even though later one could scarcely have discerned a circinate form in the two large patches; however, in Fig. 7 of Fuchs's, *loc. cit.*, the patches below the macula have also run together to form a large white patch similar to the one observed in our case. There was a trace of albumen also in one of the cases of Fuchs, although this is exceptional. We must conclude that the changes in the fundus depend

upon a disease of the circulatory system, so that this trace of albumen leads us to no false conception of the case.

This same vascular disease was also probably the cause of the glaucomatous trouble of the eye, so that retinal changes and increased tension may be regarded as merely different symptoms of the same disease. It is not plausible to think of an etiological connection between the two symptoms.

The right eyeball was placed in a 4 per cent. solution of formaldehyd immediately after enucleation, and left there several days. When the globe was divided (equatorial cut), the posterior half showed the same changes observed ophthalmoscopically, and besides these a whole wreath of fine grayish-white spots, which surround the papilla in a concentric manner on the nasal side (see Fig. 3). Between this wreath and the papilla there is a diffuse yellowish discoloration of the retina. Within this zone there is near the optic nerve a minute hemorrhage. Innumerable indistinctly defined hemorrhages are found ouside of these white patches on the nasal side, and also on the temporal side below the large white patch in the macula. There are also, in depressions found in the inner part of this macular patch, some seemingly fresh brownish-red blood plaques. These had also been seen ophthalmoscopically. The finer light-red hemorrhages had, on the contrary, remained unnoticed, as had also the nasally placed wreath of white spots and the yellowish-red discoloration between these spots and the papilla. The minuteness of these changes, on the one hand, and the corneal dullness on the other, are the probable causes of failure of their observation. It is worthy of note that the large white patch in the macula showed itself, on scrutiny with a magnifying lens, to be composed of many minute dots. The papilla showed a slight yellowish discoloration of its temporal half.

The posterior division of the globe was now cut to pieces, and some pieces placed for hardening in alcohol in the usual manner; others in a 1 per cent. solution of osmic acid, for about 8 hours, which, after a thorough cleansing with water, were also hardened in alcohol. The preparations were embedded in celloidin.

The microscopical changes will probably be pictured best by mentioning some of the general facts first, and then pointing out in detail the changes on the nasal side, and lastly, those on the temporal side of the papilla.

The optic nerve seems normal, is not excavated, and shows no signs of atrophy. In the temporal half, at the level of the deeper retinal layers a hemorrhage is to be seen. This explains the slight yellow discoloration of the papilla seen macroscopically.

In the sclera there is a peculiar state of one ciliary vessel. It is accompanied along its course from the choroid to its scleral outlet by a quantity of pigment cells. Even in the orbital tissue back of the eye there is pigment to be seen between the windings of the vessel.

The choroid contains quite a number of vessels, having in part merely thickened walls, partly really sclerosed ones, the thickening being in the media principally. Another peculiar change in the choroidal vessels will be more fully described after the description of the retina.

That which first attracts our attention in the retina is the very great hypertrophy of the supporting connective tissue. All over the posterior division of the eyeball, Müller's supporting fibres are thickened, and widen into thick wedges, base forward, in the nerve-fibre layer. In the anterior division, in the part nearest the corpus ciliare, there is considerable œdema; also larger vacuoles extending through the whole depth of the here greatly thickened retina, as well as smaller vacuoles in the inner and outer molecular layers. The retinal elements between the vacuoles seem normal.

We now pass to the changes seen in that part which had been already recognized as diseased macroscopically.

These begin nasally, close to the optic nerve, with a number of closely placed long clots, which lie in the intergranular layer with their long axes perpendicular to the retinal surface, and which present either a more homogeneous or a more granular appearance. They do not take on the usual nuclear stains, but take up aniline coloring matter very readily. We find these masses only for an extent of about

1 *mm*, followed in rapidly changing succession, by extravasations of blood and hyaline plates, interrupted here and there by a large vacuole which is filled with a fine fibrinous network. (Weigert's staining method—Fig. 4.) All these changes are confined to the intergranular layer and the extravasations are thin. Hemorrhage and hyaline plates are not always two distinctly separate forms. There are here and there spots where two forms are mixed; for instance, there may be a spot where in the deeper part of the intergranular layer there are hyaline masses, while in the more superficial parts a number of red blood-cells are seen. Or one may find a number of red blood-corpuscles encircled by a ring of homogeneous substance which is colored red by eosin, while at still another spot, a hemorrhage hides one or more clots in its centre (Fig 5). The white plates are also quite different in structure. Some are perfectly homogeneous, others are more stratified, reminding one of an amylum-granule (only of course showing no iodine reaction), while others still are more or less coarsely or finely granulated. It is just these latter forms which allow the best insight into the nature of the formations, for beside plates with indistinctly outlined granules, there are some with sharply contoured ones, and the better defined these are, the more similar is their appearance to the red blood-corpuscle.

This morphologically shown transition from hemorrhage to clot can be shown in another way. If a preparation be colored intensely with the Van Gieson stain, and rinsed thoroughly afterward in water and alcohol, the supporting tissue therein will be colored pale pink, the red blood-cells yellow, and the clods intensely red. The more hyaline forms of clots will have a shining red color, while the more granular will have an orange appearance, and between the two will be found all shades of color.

These facts lead us to the conclusion that the hyaline plaques are the end-product of the disintegration of red blood-corpuscles. At first the outlines of the latter become indistinct, so that one only distinguishes indefinite granules; the granules then undergo total disintegration, producing an amorphous mass, which gradually takes on a homogeneous

form. As to which albuminoid body this is (hyaline, colloid, etc.), could not be decided by any color reaction.

The above-described changes are limited to a space of about 8 *mm* diameter, counting from the centre of the papilla. From here on there is an interesting change found. In the middle of the hyaline plates we suddenly meet with large distended cells, having a central nucleus. The size of these cells varies from that of a granular layer-cell to that of a cell of the ganglionic layer of the retina, whereas the nuclei have about the same size as those of the granular layers. Generally there are several grouped together in or about a clot; farther toward the periphery, they seem more isolated, although one can see even here on close inspection that there are homogeneous masses between the cells.

The number and the size of these cells increase from the centre toward the periphery. At first there are only one or two such cells in a mass, and they are relatively small. Farther toward the periphery, they become more numerous and more closely packed. Sometimes there are remnants of hyaline masses in front and in back of the cells, or the cells may be arranged about a remnant of hyaline substance, the cells fitting exactly into concavities in the substance (see Fig. 6). As still farther toward the periphery there is scarcely any homogeneous substance to be found in the cell clusters, we can conclude that there probably was a time when we should have found the same picture here as in the more central parts.

In the preparations treated with osmic acid all these large mononuclear cells were stained black, some of them perfectly opaque, others filled with large black granules. Upon the addition of xylol the former are changed, under the microscope, to the granular form; these granules become gradually dissolved and one sees, finally, only a somewhat granular gray protoplasm with the typical central nucleus. These are, without a doubt, the well-known "fat granule-cells."

Their signification is made tolerably clear in our case by the manner of their occurrence. The cells are at first limited in number and lie in the clots; the homogeneous masses

are visibly lessened as the number of fat-cells increase, and seem as though eaten off in a manner similar to that of bone substance by osteoblasts, and finally there is no more hyaline substance to be seen among the cells. This is apparently the result of the absorption of the end-products of the disintegrated red blood-corpuscle, by the above-described cell. Either the material is stored up in them in the form of fat, or the cell undergoes fatty degeneration as a result of the enormous quantity of food-material taken up by it.

The appearance of the fat cells is limited to a space of about 2 *mm* length, and this zone is about 8 *mm* from the optic nerve. This zone corresponds to the macroscopically seen white dots.

The hyaline masses are situated where macroscopically the slightly yellow diffuse discoloration had been noticed. A participation on their part in the formation of the white spots can therefore be positively excluded here, and it is probable that the latter have been caused only and alone by the clusters of fat-cells.

On the temporal side of the opticus we find the same changes as on the nasal: minute, rather thin hemorrhages, hyaline plates between the papilla and the zone of the ophthalmoscopically noticed white spots, and fat granule-cells where the white spots had been seen. The transition from hemorrhage to hyaline clots can be seen equally well here, but the change from hyaline plates to fat-cell clusters cannot be as clearly followed as on the nasal side.

In the macula where the large white plate had been noticed, one can observe only an immense quantity of fat-cells, arranged partly in long rows in the intergranular layer, partly lying in very large vacuoles.

The retina has four times its natural width at these points, due to a thickening of the intergranular layer. The outer granular layer and the layer of rods and cones are missing. Within the plaque there are neither hemorrhages nor hyaline clots; the large cells are seen closely packed together. To the temporal side of the white plaque, on the contrary, where one could macroscopically still distinguish some minute white dots, fat-cells are found lying in the

clots. In these parts, the latter as well as the hemorrhages are small on the nasal side of the papilla, and there are places where one can find a single fat-cell surrounded by a small hyaline border. There are, of course, transition forms from hemorrhage to hyaline plate, and further to fat-cell clusters, to be found in these parts too, but as the process here represents an older stage, the end-product predominates.

The fact may not be without interest that these fat-cells are also found in the peripheral parts of cerebral hemorrhages, as I have convinced myself by an inspection of preparations which Professor Ribbert had the kindness to show me.

Doubt as to the suggested origin of the white spots is given only by the clinical observations, for ophthalmoscopically a direct transition from hemorrhagic to white spots is not reported. However, we have seen that many more hemorrhages were discovered microscopically than were seen either ophthalmoscopically or macroscopically. Besides there must be a stage in the degeneration of the red blood-corpuscles in this process, during which it would be impossible to see either hemorrhage or white spots ophthalmoscopically.

This corresponds exactly with the course of the changes as described by von Wecker (*loc. cit.*). He could not observe a direct transition, but with the help of Masselon's drawings of a case he was able to prove that, at points where at first hemorrhages had been seen, there were formed later white plaques.

Other fat forms beside this fatty metamorphosis were found in the osmic-acid preparations. Near the centre of those three large hemorrhages, lying to the temporal side and below the opticus, there are found in all the retinal layers, arranged in short, straight rows across it, a large quantity of small, black fat-drops. As Müller's supporting fibres are greatly thickened, one can see that these drops lie either on them or in them. This connection is best seen in the nerve-fibre layer, where the rows of fat-drops are perpendicular to the nerve fibres. Scattered fat cells are also to be seen in all the layers.

Finally, there is a third form of fat worthy of mention. These are irregular, shining bodies, about the size of a granular layer cell, which carry at their angles, or along their borders, spots stained black by osmic acid. Form and lustre seem to show that these are crystals, while the black spots contained in them seem to denote, chemically, products of fat. These forms lie in those parts between the optic nerve and the lower white plaques in the macula.

The large hemorrhages between the white plates and the papilla are all between chorioidea and retina. The blood is mostly changed to a homogeneous mass, into which pigment cells of the pigmentary layer of the retina have wandered, and from here some have forced themselves into the chorioideal tissue. These hemorrhages originated in the retina, which is entirely saturated with blood at this point.

I should like shortly to mention a peculiar change in the layer of rods and cones, which consists in a system of small, closely placed vacuoles, which have pushed themselves between the limitans externa and the rods and cones at the posterior pole of the globe. Toward the equator the rods and cones are in their proper place upon the limitans externa, although the latter forms small outward projections, upon which the rods and cones are placed, the whole having the appearance of intestinal villi.

In conclusion, I should like to consider more deeply the nature and the origin of the fat granule-cells. These are undoubtedly large mononuclear cells, capable of taking up foreign particles. This fact leads us from the beginning to exclude the idea that they could be leucocytes, for usually only the polynuclear forms take up foreign particles. Fixed connective-tissue cells do not exist here, and it is highly improbable that the elements of the supporting tissue, that is, cells belonging to the nervous system and ectodermal origin, could have this function. The only tissue left from which these cells could originate is that of the vessels, and here again the probability is that it is not the endothelium lining the blood-vessel, which breaks through the vessel wall, to attend to the absorption of this foreign matter, but rather the endothelium of the lymph spaces about the blood-vessels.

These would be mere speculations, however, if certain points in the specimens did not lead us directly to this line of thought. In the chorioidea, at the angle of junction of the chorioidea and optic nerve, temporally, there are several blood-vessels whose lumen is almost entirely filled with the same large cells as are found in the retina (Fig. 7). In the small part of the lumen still left, there are red blood-corpuscles remaining. Further than this, we find in the chorioidea, back of the macula, a blood-vessel with a greatly thickened media, in which, between media and adventitia, an oval mass, stained black with osmic acid, can be recognized. After dissolving the fat with xylol, two large, closely placed cells, having the already familiar appearance, are seen in the mass (Fig. 8).

This at least proves, first, that endothelial cells can be converted into fat granule-cells, and secondly, that such cells have actually been found in the perivascular lymph spaces. To complete the chain of evidence, this same state would have to be found in retinal vessels. This was not found, but I think that one may, notwithstanding this, come to the conclusion that in the retina, also, these cells originated in the perivascular lymph spaces of the retinal vessels.

The nature of the fat-cells is not yet perfectly explained, but endothelial origin seems probable. Further observations may bring more light upon the subject.

This investigation has brought no new discoveries to light. Hemorrhages, hyaline masses, and fat granule-cells are all phenomena which have been known in connection with albuminuric retinitis for almost 50 years, but in the observations thus far, there has been lacking an exact explanation of the pathological products. Sclerosed nerve-fibres, hyaline bodies of different forms, accumulations of round and of fat granule-cells were found, but to which of these changes the opthalmoscopic picture of white spots was due, could not be stated positively in most cases.

In our case, although we may not draw general conclusions, the comparison between the macroscopical picture and the microscopical observations shows positively, *that the white spots are brought about only and alone by fat-cell clusters, and*

further that these appeared where formerly hemorrhages had been found, but only at a time when nothing more of the hemorrhage was to be seen at that point.

The hyaline clots are the result of disintegration of red blood-corpuscles, and not, as has been thought until now, the result of exudation of albuminous fluid. Ophthalmoscopically, they are either not visible at all, or cause a dirty-red discoloration of the retina affected.

The fat-cells have the significance of phagocytes and probably originate from endothelial cells.

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3. SIEGRIST: *Report of the 25th Congress of the Ophthal. Society*, Heidelberg, 1896, p. 83.

4. WELTERT: *Arch. f. Augenheilk.*, xxxii., 3, p. 187; these ARCHIVES, xxvi., 1897.

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8. GOLDZIEHER: *Report of the 25th Congress of the Ophthal. Society*, Heidelberg, 1896, p. 78.

EXPLANATION OF FIGURES.

1. Fundus of the patient on Jan. 11, 1896.
2. The same fundus, Aug. 12, 1896.
3. Posterior division of the globe after immersion in formol for several days.
4–8. Retinal changes.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE THIRD QUARTER OF THE YEAR 1897.

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WITH THE ASSISTANCE OF

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Translated by Dr. Ward A. Holden.

Sections I.–V. Reviewed by Dr. ST. BERNHEIMER.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS. STATISTICAL REPORTS.

147. Snellen. The Eye Hospital in Utrecht. Report for 1896.

148. Eye, Ear, Nose, and Throat Hospital of New Orleans. Seventh annual report, 1896.

149. Wintersteiner. The partial stationary cataracts. Plates for instruction. Edited by Prof. Magnus. Part XI. Breslau, 1897, Kern.

150. Fick. The development of the eye. Plates for instruction. XIII. 1897, Kern.

151. Gunning. The institution for eye patients at Rotterdam. Report for 1896.

SNELLEN (147) reports on 6433 cases of eye disease, 696 receiving hospital treatment and 660 operations being done, among them 79 cataract operations, 98 tenotomies, and 88 iridectomies.

We have here again one of Dr. H. D. BRUNS's admirably prepared statistics of the work done in the eye department of the New Orleans Eye, Ear, Nose, and Throat Hospital, for the year 1896 (148). Such detailed tabulation entails an immense amount of labor, but it insures greater accuracy and carefulness in work and constitutes a valuable addition to our knowledge. During the year 2112 eye cases were registered. There were 246 operations, including 23 extractions, 20 enucleations, 36 iridectomies, and 11 operations for strabismus. BURNETT.

GUNNING (151) reports 11,268 patients, 392 of whom received hospital treatment. There were 260 operations : 50 for cataract, 70 on the muscles, and 41 on the iris.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

152. WALKAWITSCH. The bacteriology of the normal conjunctiva. *Wratsch*, 1897, Nos. 17 and 18.

153. KASTALSKAJA. On the etiology of panophthalmitis. *Wjest. Ophth.*, 1897, 4 and 5.

154. LANGE. On the anatomy and pathogenesis of congenital unilateral microphthalmus. *Graefe's Archiv*, xliv., 1, p. 66.

155. FRIEDMANN. On the use of the Roentgen rays for determining the presence of foreign bodies in the eye. *Zehender's klin. Monatsbl.*, xxxiv., p. 340.

WALKAWITSCH (152) examined the conjunctivas of 30 healthy persons in respect to their microbic contents. Direct microscopic examinations were made and also cultures. In only 3 cases were no micro-organisms found ; 20 sorts of cocci and 13 sorts of bacilli were discovered, besides some fungi and micro-organisms of decomposition. His conclusions are as follows : (1) Pyogenic micro-organisms are not present on the healthy conjunctiva ; (2) Cocci predominate ; (3) Microscopic examination revealed the presence of micro-organisms on the healthy conjunctiva in 70 % of cases, cultures revealed them in 90 % ; (4) the variety of the micro-organisms depends partly upon the season of the year (in the spring the bacillus subtilis is found on almost every conjunctiva ; (5) repeated examinations of the same conjunctiva reveal different micro-organisms ; (6) all micro-organisms found in the conjunc-

tival sac are merely accidental guests and do not remain permanently.

KASTALSKAJA (153) examined bacteriologically two eyes with panophthalmitis, which was due to injury, in one case, while in the other the etiology was obscure. In both a bacillus was found morphologically identical with the pseudo-diphtheria bacillus, but in one case giving rise to inflammation when injected into the eye, while in the other it was benign.

LANGE (154) describes in detail a microphthalmic eye. The changes could only be regarded as being due to intra-uterine inflammation. The interior was filled with a mass of fat into which the embryonic vitreous had been transformed. Unstriped muscle fibres were found in the sclera.

III.—INSTRUMENTS AND REMEDIES.

156. NATHANSON, ALEX. On the action and employment of the new local anæsthetic, holocaine. *St. Petersburger med. Wochenschr.*, 1897, 32, p. 304.

157. VALENTI. Subconjunctival injections. *Boll. d'ocul.*, xviii., 22, p. 172.

158. BOCK. A case in which holocaine acted injuriously. *Centralb. f. prakt. Augenheilk.*, xxi., p. 272.

159. FRÖHLICH. On the technique of tattooing. *Zehender's klin. Monatsbl.*, xxxv., p. 301.

160. TRENTLER. On euphthalmine, a new mydriatic, with theoretical remarks on the action of cycloplegic agents. *Ibid.*, p. 285.

NATHANSON (156) recommends a 1 % solution of muriate of holocaine as an excellent local anæsthetic which can be used wherever cocaine is of service, and which is free from the disadvantages of the latter. Complete anæsthesia of the cornea comes on very quickly after the instillation, while anæsthesia of the conjunctiva is less complete. In operations on the lids, and excision of the lachrymal sac, Nathanson drops the solution into the wound in the skin and thus obtains sufficient anæsthesia to enable him to perform a painless operation. He has observed no toxic effects. HIRSCHMANN.

VALENTI (157) speaks particularly of injections of sublimate, and records 3 cases (iritis with gumma, iridocyclitis, and hypo-

pyon-keratitis) in which the subconjunctival injections soon led to recovery. DANTONE.

FRÖHLICH (159) recommends the tattooing of corneal scars with the assistance of v. Hippel's trephine. With this instrument the superficial layers of the cornea are cut out, the base of the wound is scarified, and a thick solution of India ink is rubbed in. The eye is then kept closed until the defect is covered with epithelium. In 5 cases the wound was quite healed in a week, with a subepithelial pigmentation of the leucoma.

According to TRENTLER (160) Schering's new euphthalmine in 5–10 % solution is a powerful mydriatic, having greater efficiency than cocaine, although acting more slowly, and having less of a cycloplegic effect than homatropine. It is, furthermore, much cheaper than homatropine.

IV.—ANATOMY.

161. GREEFF. On twin ganglion cells in the human retina. *Arch. f. Augenheilk.*, xxxv., p. 156 (to be translated).

162. ELSCHNIG. Cilio-retinal vessels. *Graefe's Archiv*, xliv., 1, p. 144.

GREEFF (161) describes twin ganglion cells from a human retina stained by the Ehrlich-Dogiel method. These cells belong to the first type of the stellate cells. It is difficult to make any positive statements in regard to the physiological significance of these formations in the retina, since the conduction of excitations through the retina takes place in a purely transverse direction, from the rods and cones to the bipolar cells, and from the latter to the ganglion cells. In the case of these twin cells there are connecting tracts joining the cells in a horizontal direction.

It is probable that these and the well-known (Cajal's horizontal cells) horizontal connections in the human retina are to be considered association connections, the more so since the retina forms a true nervous centre of the central organ. "Through these, perceptions lying removed from one another are psychically conjoined."

"The horizontal cells represent association in a lower psychically concentrated sphere, the bridges between the ganglion cells association in a higher sphere."

The higher associations are much less numerous. The higher the organization of an animal, the more numerously are the associations in the retina present.

ELSCHNIG (162) examined anatomically 13 cilio-retinal arteries in 11 normal eyes that were examined in life. He divides these vessels into 3 groups: 1. Such as pass obliquely through the sclera, as direct branches of the arterial vascular network of Zinn, and enter the optic nerve; 2. Cilio-retinal vessels which, arising from the network of Zinn, enter the choroid and there divide into two or more branches, one of which passes into the retina as a cilio-retinal vessel, which the others divide up in the choroid; and 3. A branch arising from a vessel in the choroid which itself arises from the network of Zinn. Thus the author regards all cilio-retinal vessels as arising from scleral vessels, as did Leber.

V.—PHYSIOLOGY.

163. BOCCI. The cerebral visual image. *Ann. di Ottalm.*, xxvi., 3, p. 233.

164. BAQUIS. Does a cerebral visual image exist? *Ibid.*, p. 257.

165. CAMPOS. Experimental and clinical researches on the nerves which cause the secretion of tears. *Arch. d'opht.*, xvii., 9, 529.

166. MULDER. On the compensatory rotation of the eye in inclination of the head to the right or left. *Ibid.*, 8, p. 465.

167. AXENFELD. On the refractive value of the cornea and lens in the new-born; with remarks concerning ophthalmometry on the eyes of the dead. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xv., 1 and 2, p. 71.

168. LIPPS. Remarks on Heymann's article, "Quantitative Investigations on Zöllner's and Loeb's Illusion," in vol. xiv of the same journal. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xv., 1 and 2, p. 132.

169. LOHNSTEIN. Remarks on Walter's paper "On Accommodation in the Aphakic Eye." *Arch. f. Augenheilk.*, xxxv., p. 280.

170. MEYER. On the physico-optical structure of the eyes of the sheep and dog. *Inaug. Dissert.*, Rostock, 1897.

171. KATZ, R. The proper degree of illumination for continuous labor. *Klin. Monatsbl. f. Augenheilk.*, xxxiv., p. 352.

172. KOENIG. The dependence of acuteness of vision on the

intensity of illumination. *Sitzungsber. d. k. preuss. Academie d. Wissensch. zu Berlin*, xxvi., session of May 13, 1897, p. 559.

173. KOENIG. On blue blindness. *Sitzungsber. d. k. preuss. Academie d. Wissensch. zu Berlin*, xxxiv. *Sitzung. d. phys. math. Classe*, July 8, 1897, p. 718.

174. KOENIG. The dependence of the comparison of color and luminosity on the absolute intensity. *Ibid.*, xxxix., general session, July 29, 1897, p. 871.

175. MÜNSTERBERG, HUGO. The displaced checker-board figure. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xv., 3, p. 184.

176. THOMPSON, E. S. Myopia following iridectomy for chronic glaucoma. *Manhattan Eye and Ear Hospital Rep.*, Jan., 1897.

177. REID, THOMAS. Scope and limits of ophthalmometry (keratometry). *Annals of Ophth.*, July, 1897

178. PRENTICE, CHALMERS. Strabismus theories. *N. Y. Med. Journ.*, July 24, 1897.

179. WOOD, CASEY A. The effect of kindergarten work upon the eyesight of children. *N. Y. Med. Journ.*, July 17, 1897.

180. PRATT, FRANK P. What are the functions of the rods and cones and the pigment epithelium layer of the human retina? *Med. Record*, Aug. 2, 1897.

181. TILLEY, ROBERT. The personal equation among trainsmen of equal or greater importance than visual power or color sense. *Journ. Amer. Med. Assoc.*, July 31, 1897.

182. SALZMANN, MAX. The visual effect of the removal of the lens in high degrees of myopia. *Annals of Ophth.*, July, 1897.

BOCCI (163), by means of peculiar apparatus and various instruments of precision, carried out extensive experiments in regard to after-images. He holds that the after-image perceived by an eye which is suddenly opened after having been kept closed, while a strong light has been allowed to act upon the other eye, is of central origin. The nature and manner of the gradual fading and the projection of this after-image can only be explained, according to the author, by believing that the primary effect on the cortical centre is transferred through intracerebral channels to the other cerebral hemisphere, which secondary excitation he calls the cerebral visual image. DANTONE.

BAQUIS (164) praises the accuracy of Bocci's experiments, but combats his idea of a cerebral visual image, and believes that the phenomena of the after-image in question may be explained simply by rivalry of the visual fields. DANTONE.

CAMPOS (165) made his experiments for studying the secretory nerves of the tear glands on monkeys, the anatomical relations of the nerves being identical with those in man. In his first experiment, the electric excitation of the lachrymal nerve gave no marked result. In his second experiment, the repeated excitation of the orbital twig of the superior maxillary nerve each time produced a secretion of tears. Clinical observations led Campos to believe that the lachrymal nerve contains secretory fibres from the facialis. After paralysis of the 5th nerve or removal of the Gasserian ganglion, the tear secretion continues unaffected, as it does after section of the cervical sympathetic. In cases of complete paralysis of the facial nerve, no secretion of tears can be brought about either reflexly or by psychic excitation.

v. MITTELSTÄDT.

MULDER (166) opposes the views of Contejean and Delmas who deny the existence of torsion of the eye in lateral inclinations of the head. Improved methods of investigation were employed, the basis of which was the observation of after-images.

AXENFELD (167) rightly states that if the refractive value of the refractive media was the same in the new-born as in older individuals, the shortening of the axes in the new-born would give a hyperopia of 34.3 D, instead of the actually existing average hyperopia of 2–4 D.

The measurement of the cornea in still-born infants showed that the refraction of the cornea was somewhat higher than at a later age. The explanation of the low hyperopia is that the lens is more nearly spherical in the new-born. Approximately accurate measurement of such lenses showed that their refractive power was about 17 D higher than that of adult lenses.

In THOMSON'S (176) case, a glaucomatous eye, which showed emmetropic refraction before an iridectomy, became myopic 2. D after the operation. The author discusses the various means by which this change in refraction may have come about, and concludes that it is due to an advancement of the lens.

BURNETT.

REID (177) points out in this paper the limits of reliability of measurements of the corneal surface by the various ophthalmo-

meters, showing that absolute accuracy is not possible. This is especially true where the curvature of the cornea in one meridian or the other is very great and where the surface departs much from the aplanatic form. Still, with the Javal ophthalmometer and his own, which use a 3 *mm* and a 2 *mm* surface, respectively, the error in low degrees of astigmatism may be practically neglected. In degrees of astigmatism above 4. D, however, the liability to error is great; and of course in lenticular astigmatism, which he recognizes cannot be determined by the keratometer.

BURNETT.

From a study of a number of cases, some of which are related in detail, PRENTICE (178) concludes that: 1. Corneal astigmatism may be due to extrinsic muscular tension. 2. Cross-eye (strabis-converg.) and esophoria are functional and not anatomical. In accordance with the latter belief he treats convergent strabismus by what he calls the "repression" method—that is, giving the patient a strong + glass (usually + 5), through which he is required to read at the farthest distance of distinct vision.

BURNETT.

WOOD (179) is of the opinion that in our kindergarten systems we should eliminate as much as possible all that part which demands a close application of the eyes for near work, such as drawing, sewing, embossing, perforated cardwork, etc. The eyes of the kindergartners should be tested by a competent person regularly. BURNETT.

PRATT'S (180) paper is an argument in support of the hypothesis—1st. That the cones alone are the terminal cells of the optic fibres in the human retina. 2d. That the rods are supporting tissue to the cones, their outer segments practically forming a part of the pigment epithelial layer. 3d. That the tenth, or pigment layer, is that in which light vibrations are changed into nerve stimuli. BURNETT.

TILLEY (181) points out the fact that the quickness with which a trainman responds to impressions is of as great value as his correct interpretation of those sensations. He has devised an instrument for registering this faculty which he calls the "personal equation," which, however, he has not yet fully described.

BURNETT.

SALZMANN (182), after showing that the removal of the lens diminishes the refraction of the eye, increases the size of the retinal image, etc., all now well-known facts, goes on to point

out that the operation is most desirable for those who use their distant vision most. It is desirable to leave the eye myopic 2 or 3 D. For those who use their eyes for near work a great deal, the operation does not offer much that is desirable. BURNETT.

Sections VI–XI. Reviewed by PROF. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

183. SILEX. Report of the examination of the eyes of the inmates of the orphan asylum and protectory in Rummesburg. *Gemeindeblatt der Stadt Berlin*, 1897.

184. VOSSIUS. Further reports on the operative treatment of excessive myopia. *Beitr. z. Augenheilk.*, xxix., p. 1.

185. FRÖHLICH. A contribution to the surgical treatment of high myopia. *Arch. f. Augenheilk.*, xxxv., p. 267.

Among 282 boys in the Berlin Orphan Asylum SILEX (183) found 244 eyes emmetropic, 90 hyperopic, 42 myopic, and 87 with congenital defects of corneal curvature. Of 122 eyes examined in the protectory 50.8 % were emmetropic, 13.9 % hyperopic, 14 % myopic, and 21.3 % astigmatic.

VOSSIUS (184) operated on 21 patients for excessive myopia. The average increase in vision was $\frac{1}{10}$ to $\frac{1}{3}$; the highest increase $\frac{1}{2}$. Choroidal affections do not contra-indicate the operation; detachment of the retina was not observed.

FRÖHLICH (185) operated on 30 patients for excessive myopia. After discission, in 1 case he observed incarceration of the pupillary margin of the iris in the puncture, in 1 case cloudiness about the puncture, in 3 cases posterior synechiæ, in 1 case iritis with thick secondary cataract, and in 2 cases glaucomatous increase in tension. After linear extraction, in 6 cases incarceration of the iris, in 4 cases healing of the lens capsule in the corneal wound, in 2 cases iritis with hypopyon, and in 5 cases posterior synechiæ. After the secondary operation, in 1 case detachment of the retina, in 2 cases detachment later, and in 2 cases increase in the fundus changes. The course was normal in 23 of the 50 eyes operated on.

VII.—LIDS.

186. ARMAIGNAC. Primary tuberculosis of the lid and the lachrymal caruncle, generalization in the lungs and the larynx. *Ann. d'ocul.*, cxvii., p. 354.

187. Sbrana. Osteoma of the upper lid. *Boll. d'ocul.*, xvii., 23, p. 177.

188. Brault. Congenital lipoma of each eye. *Arch. d'opht.*, xvii., 7, p. 440.

189. Schimanowsky. On the question of the congenital cysts of the lids with microphthalmus. *Wjestnik Ophth.*, 1897, Nos. 4–5, p. 317.

190. Zünzel. Congenital filiform anchyloblepharon. *Prager med. Wochenschr.*, 1897, No. 37.

191. Jener. On the operation for distichiasis. *Wiener med. Wochenschr.*, 1897, No. 14.

192. De Vincentiis. Elephantiasis and pseudo-elephantiasis. *Lav. d. Clinica ocul. d. R. Univers. di Napoli.*, v., 1, pp. 1, 45, and 65.

193. v. Siklosy, Jun. On operations for distichiasis and entropium. *Pester med.-chirurg. Presse*, 1897, Nos. 38 and 39.

194. Adjemian. On the use of Thiersch grafts in the treatment of cicatricial ectropium. *Arch. d'opht.*, xvii., 8, p. 487.

195. Koster. A new ptosis operation. *Nederlandsche Oogheelkundige Bydragen*, 1896 (?), 4, p. 14.

196. Darier. Tetanus following a slight traumatism of the lid, death in three days. *Soc. d'opht. de Paris*, 1897, June 1.

197. Beard, C. H. Blepharoplasty. *Amer. Jour. of Ophth.*, June, 1897.

Sbrana (187) saw in Tunis an Arab, forty-eight years of age, who had a marked swelling of the upper lid, which, as in ptosis, drooped and was scarcely movable. The trouble had existed since childhood, beginning as a small tumor at the outer commissure, and had attained an enormous size in the last two years. On palpation the author found above and along the outer two-thirds of the lid margin a broad hard mass lying loose between the skin and tarsus. At the operation a bone-like lamella was found imbedded in a dense capsule between the tarsus and the orbicularis muscle. This was of spindle shape, 15 *mm* long, 5 *mm* broad, and 2 *mm* thick. Histologically it consisted of bony tissue. Some bony nuclei scattered through the connective tissue indicated the starting-point of the neoplasm. The author diagnosed the growth as a bony formation, probably congenital and originating at the outer commissure. He states that he has found no record of a similar growth. Dantone.

SCHIMANOWSKY (189) removed congenital lower-lid cysts with microphthalmus from two children. In both cases the cysts lay in a depression in the floor of the orbit and were adherent to the periosteum. One specimen was examined carefully. The author's conclusions are as follows.: 1. The development of these cysts is in relation with the development of the fœtal ocular cleft. 2. The cavity of the cyst is lined with neuro-epithelium having the characteristics of the primary optic vesicle. 3. The formation of these cysts is not in the line of the irregular development of the surrounding mesoderm, which results in all sorts of ocular colobomas. 4. Inflammation in the mesoderm is one of the most probable causes of the disturbances of development. 5. The cerebral changes must be considered partly as consequences of and partly as due to the same causes as produce mesodermic developmental anomalies. HIRSCHMANN.

Under the designation "anchyloblepharon filiforme adnatum," Hasner, in 1881, described a congenital thread of tissue uniting the upper and lower lids. A second analogous case is now described by ZÜNZEL (190). In a new-born child an epithelial filament extended from one lid margin to the other. When the lids were opened the filament stretched to a length of 5 *mm.* The author regards it as a result of the imperfect breaking up of the epithelial union of the lids that exists in the last half of fœtal life. Hasner believed it to be the result of fœtal inflammation. HERRNHEISER.

DE VINCENTIIS (192) made an exhaustive comparison of 39 cases reported as elephantiasis, neuroma, hypertrophy of the skin, etc., of the upper lid, and attempted to separate them into true and pseudo-elephantiasis. In conclusion, he described a case of each which he had personally observed. DANTONE.

v. SIKLOSY (193) recommends Hess's operation for distichiasis and entropium of the upper lid.

ADJEMIAN (194), after making a plastic operation according to Lefort-Wolff in 2 cases of cicatricial ectropium without success, took up Thiersch grafts, and employed this method in 42 cases, obtaining an excellent result 26 times, a moderately successful result 11 times, and no result in 5, due to the death or loosening of the grafts. Above all, it is necessary to dissect up the lid so as to produce as large a wound surface as possible, and then to increase this surface by passing sutures through its margin and the forehead or cheek, as the case may be. The grafts were

1½–2½ *cm* wide and 3–4½ *cm* long. After the epidermis is cast off, a boric-acid vaselin dressing is used for a considerable time. Only rarely does the transplanted graft shrink to one half its original size; usually the shrinking is less. A tarsorrhaphy is required in some cases. The author strongly recommends this procedure, and he reports 12 of his observations in detail.

V. MITTELSTÄDT.

The operation for entropion performed by BEARD (197) has the Hotz operation as a basis. The principal variations from this well-known procedure are the smallness of the lower flap of skin, it being not over 4 *mm* broad. This is dissected, with the orbicularis, from the tarsus down to where the roots of the cilia are visible, but not through to the incision which has been previously made in the free border of the lid, and which detaches the conjunctiva from the inner surface of the tarsus. After grooving the tarsus, a suture is inserted in the upper edge of the lower flap, and the needle carried above the upper border of the tarsus and inserted in the tissues there and brought out in the skin of the lid some distance above the incision. The surface must now be cleaned carefully, and in tying the suture care must be taken that the tarsus bends outward and not inward, as it may do if not managed properly. The defect in the tarsal edge he fills in with a graft from the inside of the lip and without sutures. He much prefers this to skin. Cases with illustrations are given. [This operation is not new; it is performed extensively in Europe as well as in America, and yields good results.—H. K.]

BURNETT.

VIII.—LACHRYMAL APPARATUS.

198. KÜMMEL. Further contributions to the subject of the symmetrical affection of the lachrymal and parotid glands. *Mitth. aus den Grenzgebieten der Medicin und der Chirurgie*, 1897, ii.

199. TERSON. Comparison between different cases of extirpation of the palpebral lachrymal gland. *Arch. d'opht.*, xvii., 7, p. 418.

200. PUCCIONI. An unusual case of ectasia and emphysema of the lachrymal sac. *Boll. d'ocul.*, xviii., 20, p. 155.

201. MAUSEY. On the malignant tumors of the region of the caruncle. *Inaug. Dissert.*, Greifswald, 1897.

202. BETTRÉMIEUX. Recovery from tic douloureux. *Arch. d'opth.*, xviii., 9, p. 560.

203. SCOTT, KENNETH. Remarks on the treatment of a case of complete obliteration of the nasal canal, followed by cure. *Annals of Ophth.*, July, 1897.

204. SCOTT, KENNETH. Sarcoma of the lachrymal gland. *Ibid.*

TERSON (199) compares the effect of extirpation of the palpebral lachrymal gland on the different sorts of lachrymation, which he divides into hypersecretory and hyposecretory. In one case in which long-continued treatment with sounds was of no avail, the passages being wide and free from secretion, the lachrymation was relieved permanently by removing the palpebral gland. In a case of traumatic obliteration of the tear passage, the slight lachrymation was scarcely diminished by removing the gland. And in an earlier case like the last, little was effected by removing both palpebral and orbital gland. Since then the author practises the removal of the palpebral gland only. The operation meets expectations chiefly in moderate lachrymation, less in slight lachrymation, but particularly in cases like the first mentioned, in which there is hypersecretion with intact passages. The passages are to be kept open, otherwise the operation is hardly sufficient to relieve the trouble. v. MITTELSTÄDT.

PUCCIONI (200) found, on opening a tumor of the tear sac as large as a pigeon's egg, that the contents were not liquid, but consisted of air. An actual abscess had been opened two months before. Since both canaliculi were occluded, the author believes that in blowing the nose, air was forced up from the nose and held confined in the sac by some valve-like fold in the mucous membrane. Probing of the entire canal and excision of a portion of the mucous membrane at the mouth of the sac brought about a permanent cure. DANTONE.

BETTRÉMIEUX's (202) patient suffered with repeated spasm of the right facial nerve and excessive lachrymation. Probing the canal and correcting refractive and muscular errors with glasses relieved the lachrymation, which in such cases is usually supposed to be due to the nerve affection. v. MITTELSTÄDT.

In SCOTT's (203) case these was a complete bony occlusion of the nasal duct. This he drilled through by means of a dental burr, introduced through the lower canaliculus and into the sac as a probe is ordinarily. The first burr was 3 *mm* in thickness, but others were used reaching as high as 4.5 *mm* in diameter. Through the opening thus made a leaden style was introduced and allowed

to remain until the parts had healed, leaving a patent canal. He has used the same line of treatment in cases where the occlusion was not complete, but partial. BURNETT.

SCOTT's (204) patient was a woman of eighteen years with the usual symptoms of lachrymal-gland tumor of the right eye. The tumor was removed. It was 37 by 30 and 10 *mm* and weighed 7 grams. On section it proved to be a round-celled sarcoma. No return ten months later. BURNETT.

IX—MUSCLES AND NERVES.

205. REDDINGIUS. The cause of convergent squint. *Med. Weekblad*, 1897, p. 309.

206. REDDINGIUS. Squint. *Ibid.* (?), p. 322.

207. STEFFAN. Experiences and studies in regard to strabismus. *Arch. f. Augenheilk.*, xxxv., p. 200.

208. SACHS. On the symptomatology of ocular muscle paralyses. *Graefe's Archiv*, xliv., 2, p. 320.

209. ROTGANS. Oculo-motor paralysis. *Geneesk. Tydschrift*, 1897, 1, p. 372.

210. WARRINGTON. A case of congenital double abducens, and right-sided facial paralysis. *Ophth. Review*, xvi., p. 99.

211. THOMPSON, A. H. A case of loss of conjugate movement of the eyes to either side; almost complete recovery. *Ibid.*, p. 102.

212. COLBURN, J. E. Congenital nystagmus. *Amer. Journ. of Ophth.*, Aug., 1897.

213. GILES. A case of paralysis of the external rectus. *Manhatten Eye and Ear Hospital Reports*, Jan., 1897.

214. OLIVER. A clinical study of the ophthalmic symptoms seen in a fracture of the anterior base of the skull. *Amer. Journ. Med. Sciences*, July, 1897.

STEFFAN (207) opposes the idea of amblyopia ex anopsia, recognizing only congenital amblyopia. The operative treatment of squint should be undertaken only when all other means of obtaining the desired result fail. Until the refraction of a child has become fixed, one should not operate. The earlier the operation, the less certain will be the ultimate result.

A woman with carcinoma, as ROTGANS (209) reports, had a

paralysis of one oculo-motor nerve. The pupil was small and reacted to light. A nuclear paralysis was suspected, but a cerebral metastasis did not seem probable since a tumor would have to be very small not to produce more extensive paralyses. It seemed more probable that the trouble was of syphilitic origin.

Iodide of potassium was given, but the paresis was not changed and the pupil remained as before. Later, vision failed until complete blindness resulted. The trigeminus became hyperæsthetic, and a firm swelling appeared, deep below and above the malar bone, which led to the diagnosis of carcinoma cranii. At the autopsy a carcinoma of the clivus Blumenbachii was found, which had extended toward the cavernous sinus where the oculo-motor lies. The abducens lay imbedded in fibrinous tissue.

From this it appears that the oculo-motor nerve behaves like the inferior laryngeal,—only particular muscles may be paralyzed. A partial paralysis can thus be a peripheric paralysis.

WESTHOFF.

In WARRINGTON'S (210) case there was complete paralysis of both external recti, with paralysis of right facial muscles, the orbicularis palpebrarum escaping, and the lower muscles of the face. The birth was prolonged, there were supernumerary digits, some mental obtuseness. Patient otherwise well built and healthy. List of references given. WERNER.

THOMPSON'S (211) patient, a healthy man aged fifty-five, suddenly lost power of lateral movement of eyes. Convergence intact. Knee reflexes increased. In five weeks internal recti recovered. In eleven weeks external recti partially recovered. There remained permanent weakness of left external rectus. The author gives three recorded cases of recovery from bilateral conjugate paralysis, in one of which convergence was retained. The temporary duration points to a lesion above the nucleus, probably where the fibres from the hemispheres to the nuclei cross each other. WERNER.

From a study of a large number of cases of congenital nystagmus, some of which are reported in detail, COLBURN (212) concludes that the condition may be due to amblyopia from any cause or from ametropia. It may also arise from atypic development of the eye and its appendages, or be due wholly or in part to the exhaustion or irritation of the ocular muscles or the nerve centres, in attempting to co-ordinate with the other acts of vision. In the latter instances the eyes should be trained to per-

form their ranges of rotation with the head fixed, and such operation should be made on the recti as shall secure full motion and fixation with the eyes at the point of greatest rest. BURNETT.

GILES's (213) case was one of paralysis of external rectus of left eye with diplopia of long standing. He excised a portion of the muscle, making the eye straight, and there was diplopia only in extreme fixation towards the left and right. BURNETT.

In this case, a thorough history of which is given by OLIVER (214), a man had his head compressed laterally between two loaded cars. He was rendered immediately unconscious, and blood ran from the right ear. When seen by Oliver a year later, there was an involvement of the seventh nerve back internal to the chorda tympani and tympanic branch. There was also a temporary paresis of the palatal, glossal, and pharyngeal muscles, which would indicate a lesion near the hiatus Fallopii. The auditory nerve on that side was also profoundly affected. The optic nerves were also pressed upon as evidenced by the concentric contraction of the visual fields and an increased size and tortuosity of the retinal veins. The third nerve of each side was also involved, indicating a lesion near the clinoid process. The fact that both abducens were paralyzed indicated a lesion under the clinoid process, at which place these two nerves lie the closest together. The patient was treated for a long while with iodides, and was getting gradually better. BURNETT.

X—ORBIT AND ACCESSORY CAVITIES.

215. BOCCHI. Fibro-myoma of the orbit. *Arch. di Ottalm.*, v. 1–2, No. 59.

216. NEESE. A case of angioma orbitæ fibrosum. *Arch. f. Augenheilk.*, xxxv., 1, p. 9. (Removal after enucleation. Illustrations; bibliography. Will be translated.)

217. RUMSCHEWITSCH. A case of cavernous angioma of the upper lid. *Zehender's klin. Monatsbl.*, xxxiv., p. 294.

218. MARKOW. Two cases of echinococcus of the orbit. *Jeschenedjulnik pract. Med.*, 1897, No. 22.

219. NEULEN. On the pathogenesis of traumatic enophthalmus. *Inaug. Dissert.*, Greifswald, 1897.

220. FRANKE. A case of pulsating exophthalmus cured by bilateral ligation of the common carotid. *Beiträge. z. Augenheilk.*, xxix., p. 19.

221. HIRSCH, C. A case of traumatic pulsating exophthalmus. *Ibid.*, p. 31.

222. MARSHALL, C. DEVEREUX. On meningitis following excision of the eyeball for panophthalmitis. *Royal London Ophth. Hosp. Reports*, xiv., p. 312.

223. BRUNER. Traumatic enophthalmus. *Ophth. Record*, Sept., 1897.

224. BULLARD. Malignant growths of the orbit. *Ibid.*, July, 1897.

225. BANE, WM. C. Orbital periostitis, report of a case. *Ibid.*

BOCCHI (215) removed a tumor as large as a nut, lying between the ball and the roof of the orbit, which was attached to the superior rectus, but was otherwise free and movable. Histological examination showed it to consist of fibrous tissue pervaded with many striped-muscle fibres, it being therefore one of the rarely observed fibro-myomas like those reported by Lodato (*Arch. di Ottalm.*, 1896), Zenker (*Virchow's Archiv*, 1889), Bayer (*Nord. med. Archiv*, xiv.), and Jennings (*Amer. Jour. of Ophth.*, 1895). The tumor did not recur. There remained some ptosis and a downward squint, but otherwise the ocular functions were normal. DANTONE.

Both of the cases of echinococcus reported by MARKOW (218) were operated on in the Charkow university clinic. In both cases the vision of the very prominent eyes was nil before the operation. Following the operation one eye had perception of light and the other V = $\frac{6}{16}$.

After falling from a wagon, a laborer, aged twenty-one, was found by FRANKE (220) to have a left pulsating exophthalmus. Digital compression of the common carotid was employed without any result, so ligation of the left common carotid was done, and, the result of this not being satisfactory, the other carotid was ligated, after which the exophthalmus gradually disappeared.

A miner, aged twenty-six, received an injury to the right side of the head, followed by bleeding from both ears, the nose, and the mouth. HIRSCH (221) found also bilateral exophthalmus. The left exophthalmus gradually disappeared, but on the right side a pulsating exophthalmus gradually developed with scarcely any subjective symptoms. Digital compression of the carotid for 40 hours in 27 sittings through a period of 19 days brought about improvement.

MARSHALL (222) records five cases of fatal meningitis after enucleation. The ages of the patients varied from twenty-one to seventy-two years. Case 1.—Patient in bad health, eye suppurating four days before operation; eyeball accidentally opened. Case 2.—Eye excised three days after onset of suppuration. No basal meningitis, only on convexity. Case 3.—Eye excised three weeks after onset of suppuration. Severe headache, and appearance of patient suggestive of acute disease at time of operation. Pus escaped from globe during operation. Case 4.—Eye suppurating three weeks. Nerve cut close to eyeball, hardly any meningitis at base. Nerve normal. Orbital fat healthy. Case 5.—Eye suppurating seventeen days. Cataract extraction twenty-four days before excision. Purulent contents escaped during enucleation. Extensive meningitis of surface and base. In 34 cases collected by Nettleship 5 recovered; others ended fatally in 2 to 4 days (longest 8 days). Symptoms began within twenty-four hours in all. Tay published (*Ophthal. Hosp. Rep.*, vii., p. 506) a fatal case of meningitis from panophthalmitis without excision, and Marshall here describes another seen by Dr. Tay. Nettleship also records three similar cases, one as the result of needling a cataract. Marshall tries to prove that meningitis may be latent and may frequently exist before excision. He advocates removal of first firm dressing two hours after operation. The deaths have been 0.12 per cent. of the total excisions in Moorfields.

WERNER.

In BRUNER'S (223) case the patient had a blow across the nose, which fractured it and also the outer wall of the orbit. Following this there was marked enophthalmus with vertical diplopia, with an inclination of the false image. The whole of the left side of the face is shrunken. Vision is good. BURNETT.

BULLARD'S (224) case was primarily one of encapsulated tumor of the lachrymal gland of the left side occurring in a man of thirty-six years. It was successfully removed and found to be an adeno-sarcoma. Nearly a year after, the disease returned and the eyeball was removed and the orbit cleaned out. Some months later there was a return. The periosteum of the orbit was then scraped off entire and the bone thoroughly cleaned. The tumor again returned, but more slowly, and the patient died five years after he was first seen. BURNETT.

BANE'S (225) case was that of an infant of five weeks in which there was a pronounced periostitis of the orbit, without assignable

cause, on the right side. The abscess was opened, and a few days later a piece of bone about 1 *cm* long and 3 *mm* wide was removed, after which full recovery was established.

BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA, AND ANTERIOR CHAMBER.

226. AMMANN. Abortive blennorrhœa neonatorum. *Zehender's klin. Monatsbl.*, xxxiv., p. 307.

227. ELSCHNIG. Molluscum contagiosum and conjunctivitis follicularis. *Wiener klin. Wochenschr.*, 1897, No. 43.

228. HERMANN. Ophthalmological observations in Syria and Palestine. *Wjest. Ophth.*, 1897, 4–5.

229. STEFFAN. Experiences with trachoma in Frankfort-on-the-Main during the years 1861–1897. *Centralbl. f. prakt. Augenheilk.*, xxi., p. 290.

230. ONISI. Some statistical remarks on 2641 cases of trachoma. *Ibid.*, p. 189.

231. NEESE. Trachoma and its treatment. *Deutsche med. Wochenschr.*, 1897, No. 43.

232. EPINATIEW. Airol in trachoma. *Wojenno med. Journ.*, Aug., 1897.

233. TRUSSOW. The treatment of trachoma.

234. DARIER. The tarsal form of spring catarrh. A clinical, anatomical, pathological, and therapeutical study. *Annals of Ophth.*, July, 1897.

235. SCHLUB. Formation of fibroma at the limbus in spring catarrh. *Arch. f. Augenheilk.*, xxxv., p. 137 (will be translated).

236. RUMSCHEWITSCH. A case of cystoid formation in the bulbar conjunctiva. *Ibid.*, p. 295.

237. TSCHREYT. On cysts of Krause's glands. *Ibid.*, p. 282.

238. NOBBE. On the lipo-dermoids of the conjunctiva. *Graefe's Archiv*, xliv., 2, p. 334.

239. BURNETT, S. M. Hints on the hygiene of trachoma and the influence of climate and altitude in its management. *Amer. Journ. of Ophth.*, July, 1897.

240. KYLE, J. S. Some observations upon the irritating effects of the natural gas upon trachoma. *Ibid.*, June, 1897.

241. KNAPP, GEORGE. Ophthalmia nodosa. *Ibid.*, Aug., 1897.

AMMANN (226) observed a purulent discharge from both eyes of an infant five days old, which disappeared after a 1 % solution of nitrate of silver had been used a few times. Gonococci were found in the secretion. It was an abortive form of blennorrhœa neonatorum.

ELSCHNIG (227) reports 6 cases of molluscum contagiosum on the lids, which caused a follicular conjunctivitis. The latter passed off as soon as the molluscum was removed.

HERMANN (228) visited 34 places in Syria and Palestine for the purpose of studying trachoma in the schools. 3106 pupils were examined, and many dispensaries were visited. He found no eye diseases peculiar to the country, but much acute and chronic conjunctivitis and trachoma depending upon lack of cleanliness and bad hygienic conditions. In the schools of Syria 33 % of the pupils were affected with eye diseases, trachoma making up 15 %; in the schools of Palestine 60 % had eye diseases, trachoma being found in 51 %. HIRSCHMANN.

In the course of 36 years, STEFFAN (229), among 129,865 cases of eye disease, found trachoma 5193 times, 2523 times in the cicatricial stage. The number of cases decreased from year to year. The subjects were mostly laborers in Frankfort who lived in the neighborhood. Residents of the town were rarely affected.

According to ONISI (230), trachoma makes up 25 % of all the eye diseases in Japan. It attacks patients of any age, but is most frequent between the ages of fifteen and thirty. 24 % of the trachoma patients have pannus.

Among NEESE'S (231) patients in Kiew, 25 % suffered from trachoma. Corneal complications were observed in 90 %, typical pannus in 52 %, and blindness in 3 %. Besides copper, silver, and alum, the author recommends a 1–2 % kreolin solution, which acts favorably both on the follicles and on the pannus. Operative procedures are of advantage. Dividing the outer commissure relieves the affected cornea from the too great pressure of the lids. The excision of the retro-tarsal fold and of portions of the tarsus is to be avoided. Expression, however, is of great service.

The dusting of airol into the eyes of thirteen trachomatous soldiers regularly for a month did not, according to EPINATIEW (232), cause any improvement.

TRUSSOW (233) recommends the surgical treatment of pannus.

The conjunctiva is strewed with cocaine powder, the granulations are expressed with forceps, and the conjunctiva is rubbed with cotton dipped in 1 : 1000 bichloride solution until it bleeds.

DARIER (234) considers that certain cases of hard granulations on the palpebral conjunctiva, which have been commonly classed as trachoma, are but manifestations of vernal catarrh. The clinical history of such cases is different from that of trachoma, and histological examinations made of some excised tissue by Dr. H. Villard he considers confirms the diagnosis. Villard finds the leucocytic infiltration not limited to the superficial layer of the conjunctiva, as it is in trachoma, but it involves both the superficial and deep layers. The fibrous tissue which forms the principal part of the nodules in spring catarrh is composed of thick, resisting bands, whereas in trachoma they are thin and delicate. Treatment he has found of little avail, except scarification and excision of the larger masses. BURNETT.

SCHLUB (235) describes three cases of fibroma formation at the limbus in spring catarrh. Exceptionally the usual new tissue appearing here is of an epithelial character, but new formation of connective tissue may give it a fibromatous character.

RUMSCHEWITSCH (236) reports on a congenital cystoid formation in the bulbar conjunctiva. This was multilobular, its base partially covering the atrophic cornea. There probably existed at the end of fœtal life an inflammation of the cornea, with ulceration leading to perforation, the latter extending to the bulbar conjunctiva. The passage of aqueous humor under the conjunctiva undermined it and thus the cyst arose.

TSCHREYT (237) describes two cases of cyst formation in Krause's glands. These cysts lie in the retrotarsal fold, presenting beneath the epithelium as transparent vesicles with clear liquid contents, and varying in size from that of a pin-head up to that of a hazel-nut.

After reporting four cases of lipo-dermoid of the conjunctiva, NOBBE (238) gives a detailed description of these tumors. All the tumors of this sort so far published were teratoid new formations of dermoid character, whose origin is not to be sought in the orbital fat. They are situated at the sclero-corneal junction, in the retrotarsal fold, or in the caruncle.

While not believing that trachoma is essentially a contagious disease, BURNETT (239) thinks that overcrowding, bad air, and dust are some of the most potent factors in its development.

High altitudes, if dusty, are not good for trachoma patients, and general farming is not a favorable occupation. BURNETT.

KYLE (240) has noticed that in the regions where natural gas is much used there is a large amount of conjunctivitis which is not cured until another form of lighting is employed. The natural gas is imperfectly consumed, leaving much deleterious matter in the air, which is very irritating to the conjunctiva.

BURNETT.

KNAPP (241) relates the histories of 3 cases of ophthalmia nodosa, in all of which the diagnosis was confirmed by extirpating the nodules and finding the hair of the caterpillar. In one it affected the iris, in another the conjunctival cul-de-sac, and in another the cornea. The inflammatory symptoms, which were generally severe, subsided after removal of the hair.

BURNETT.

242. PETRASCO. On a peculiar form of keratitis. *Wiener med. Presse*, 1897, No. 43.

243. MARKOW. Galvanization of the eyeball. *Wratsch*, 1897, No. 31.

244. STRAUB. On pathological vessel formation. *Geneesk. Kring.*, Amsterdam, Jan., 1897.

245. WESCOTT, C. D. Keloid of the cornea. *Annals of Ophthal.*, July, 1897.

246. MARSHALL, C. DEVEREUX. On interstitial keratitis and its complications. *Ibid.*

PETRASCO (242) observed, in an otherwise healthy girl of nine, the appearance of a small corneal infiltration which disappeared to reappear four weeks later, and this monthly reappearance has kept up for two years.

Galvanization of the eye was employed by MARKOW (243) in a case of tedious recurrent iritis with hypopyon, with remarkable effect. Since then galvanization has been much used in various suppurative affections seen at his clinic. A current not stronger than 1½–2 M. A. is applied for five minutes, the anode on the closed eye, the cathode in the region of the cervical sympathetic or an indifferent spot. He begins with ½ M. A. Treatment is continued 2–15 days. HIRSCHMANN.

In WESCOTT'S (245) case, a child of two years had a growth on the cornea following an attack of oph. neonat. It looked like an ordinary staphyloma, but when examined after enucleation of

the eye it was found to present all the appearances of a keloid growth. The diagnosis given by Dr. Hektoen, who made the histological examination, was "hyperplasia of the substance proper of the cornea (keloid), with epithelioma of the anterior surface, and a pigment layer on the posterior surface, due to prolapse of the iris." BURNETT.

In this paper MARSHALL (246) demonstrates from microscopical sections what has long been held clinically by many, that the so-called interstitial keratitis is not simply a keratitis but really a uveitis. He shows that almost the first manifestation of the disease is in the form of a serous iritis, and that the iris, ciliary body, and choroid are always involved. For this reason he deems atropine the chief local remedy, particularly in the early stages. BURNETT.

(To be concluded in the following number.)

REPORTS OF THE TRANSACTIONS OF THE SECTION ON OPHTHALMOLOGY AND OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

OPHTHALMOLOGICAL PART OF THE ANNUAL MEETING HELD JANUARY 17, 1898, THE PRESIDENT, DR. E. GRUENING, IN THE CHAIR.

In executive session, the Section reëlected Dr. E. Gruening as Chairman, and Dr. W. B. Marple as Secretary for the ensuing year.

The Section also voted to publish reports of its Transactions in the ARCHIVES OF OPHTHALMOLOGY and in the *Archives of Otology*.

PRESENTATION OF SPECIMENS AND CASES.

Dr. J. H. CLAIBORNE showed some drawings (by Dr. Holden) of a case of his, who failed to present himself, where in both eyes the **retinal arteries made a loop forwards** into the vitreous and then back to the disc.

Dr. T. Y. SUTPHEN presented a case which in 1887 showed complete detachment of the retina with entire loss of sight. The usual treatment availing nothing, he had punctured the retina after the method of De Wecker, the patient remaining in bed one month afterwards. Apposition in the right eye was complete with normal sight and field, which had remained so now for ten years. In the other eye, though the operation was at first followed by equally good results, the retina subsequently became detached again.

Dr. H. H. TYSON presented a case of **pulsating exophthalmus.** Patient fell on the head. Intermittent deafness. V—$\frac{8}{200}$. Fundus shows large veins, small arteries. With stethoscope bruit can be heard over globe and temple. Diagnosis: pulsating exophthalmus, rupture of internal carotid in cavernous sinus (ligation of common carotid subsequently done).

The Chairman said that in these cases the first lesion usually is a fissure at the base of the cranium; rupture of the carotid is secondary. The fissure is not usually extensive, as in most cases the cranial nerves are not largely involved.

Dr. W. B. NOYES presented a microscopical specimen of a **small round-cell sarcoma,** growing from the hyaline membrane lining the posterior surface of the lens. Dr. WEEKS expressed the opinion that it was a glioma.

The rest of the evening was devoted to otological subjects (see February, 1898, number of the *Archives of Otology*).

W. B. MARPLE, Secretary.

OPHTHALMOLOGICAL PART OF THE MEETING OF FEBRUARY 21, 1898, THE PRESIDENT, DR. E. GRUENING, IN THE CHAIR.

Dr. A. JACOBI presented a case of **amaurotic family idiocy** (Sachs) with symmetrical changes at the macula. The girl is at present one year old, the fourth child of healthy, not neurotic, not syphilitic, and not alcoholic parents, who emigrated from Russia, both belonging to the Semitic race. The other children are in good health. The child smiled late, and had the first tooth at ten months of age. The fontanelle is about to close. Circumference of the head 40 *cm.* Never sat up, lost slowly what she had of intelligence after the seventh month, cried but seldom, slept much, had some spastic contractions of the upper extremities. Excitability by the interrupted current slow; contraction takes place after one or two seconds. Galvanic current yields the reaction of degeneration. Patellar reflexes a little exaggerated. Thyroid normal. Slight dulness over the manubrium sterni. Muscles feeble and flabby, do not support the head. Moderate rhachitical curvature of the diaphyses. Sight impaired, almost absent. Pupils contract but very little under the influence of light. No nystagmus, no strabismus, no convulsions. Shape and curvature of the eye normal. There is a white patch with a red centre in place of the macula lutea and beyond it; in its centre there is a depressed spot. The optic disc is pale and gray, altogether the same condition which was first described by Warren Tay of London (1881) and in this country by Knapp in 1885.

In discussing Dr. Jacobi's case, Dr. B. SACHS said that it was interesting to see the way the observations of the ophthalmolo-

gists (among whom Dr. Knapp was one of the first) and those of the neurologists had finally been fused to constitute one common type of disease. The neurological aspect of amaurotic family idiocy was quite as distinct as the ophthalmological aspect is said to be. Idiocy, blindness, and a uniform progress to a fatal issue are the symptoms of this new clinical condition. That this represents a distinct form of disease can be inferred from the reports of the cases of Kingdon and others. It is related clinically to other forms of family neuroses: notably to spastic palsies in various members of a family; also to hereditary idiocy, and possibly to hereditary optic neuritis, though the last named disease is observed at the age of sixteen, eighteen, or twenty years. He has had two autopsies on these cases of amaurotic family idiocy. There is a widespread loss of nerve elements, especially in the cortex. Also degeneration in the spinal cord. Is the latter a secondary degeneration or is it due to defective development? He was of the opinion that all children were born with a certain potentiality of development. In the cases of the disease under discussion, this power of development ceased at about six months, and subsequently degeneration commenced. There is no evidence of any preceding inflammatory condition. He would suggest to the ophthalmologist the necessity of examining these cases to see whether the changes are confined to the macula, and whether or not the optic-nerve atrophy may not precede the changes in the region of the macula lutea. Possibly in some cases, otherwise resembling this form, the optic atrophy may be developed without any involvement of the macula.

Dr. W. A. HOLDEN stated that in two eyes which he is now examining, the retina, including the macula, seemed to be normally developed. The pathological changes were: First, a slight œdema of the nerve-fibre and ganglion-cell layers throughout the retina. The thickness of these two layers about the macula would account for the œdema here being visible ophthalmoscopically. Secondly, the ganglion cells were large, but not otherwise of abnormal appearance in Müller's fluid, celloidin, and hematoxylin preparations; but sections cut in paraffin, and stained by Nissl's method, from the eye, hardened in formol, showed an almost complete absence of chromophilic granules in the ganglion cells, and their nuclei, though central, were stained diffusely. Thirdly, in the optic nerve the medullary substance of a certain number of fibres in each bundle was found to have broken down.

His first impression was that the swelling and bleaching of the ganglion cells, and the ascending degeneration of the nerve fibres, was the result of the continued œdema. Dr. Hirsch, however, whose case this was and who was now working on the brain and cord, had found marked changes in the ganglion cells without evidence of œdema of the tissues.

Dr. Sachs asked Dr. Holden if the œdema was primary, and to what it was due. Dr. Holden replied that œdema of the retina is observed after blocking of the vessels, in cases of disease of the vessel walls, and in altered states of the blood.

Dr. W. B. MARPLE presented a case of **pemphigus** of the conjunctiva (account to be subsequently published).

Dr. H. KNAPP said that he had at present under his care a case which he at first considered of trachomatous nature, but now after having seen Dr. Marple's case and heard his remarks, he felt sure that it was an extreme case of pemphigus, showing, besides the changes in both eyes, atrophy of the mucous membrane and turbinated bones of the nose. The patient had been temporarily improved by an entropion operation.

Dr. S. POLLITZER said that he had seen a case in London several years ago, and thought there was little doubt of the diagnosis in Dr. Marple's case.

Dr. T. R. POOLEY said that he had also had a case some years ago, in a much more advanced stage than the one shown by Dr. Marple to-night. The outcome in his case was also bad.

Dr. POLLITZER, in answer to a question of the Chairman, said that the cutaneous lesions were too superficial to have cicatrices.

Dr. S. POLLITZER read a paper, entitled "Remarks on the Histology of **Xanthoma Planum Palpebrarum,**" with demonstration of specimens.

The material for his studies was derived from thirteen cases of the different kinds of xanthoma. The conclusions drawn from the study of these cases were as follows: Xanthoma is due to the degeneration of pre-existing muscle-tissue. The so-called xanthoma cell is a fragmented muscle fibre in a state of granulo-fatty degeneration, with a proliferation of the muscle-cell nuclei. All the various stages of this process from the normal muscle to the "xanthoma cell," loss of striation, fragmentation of the fibres, reticulation of the protoplasm, proliferation of nuclei, etc., may be seen in suitable specimens and were demonstrated under the microscope and in micro-photographs, as well as in a

series of drawings for which the writer expressed his thanks to Dr. Ira Van Gieson.

This explanation of the origin of eyelid xanthoma harmonizes with a number of hitherto unexplained clinical and pathological facts; *e. g.*, the absence of any clinical signs of tumor; its almost exclusive occurrence in the face where peculiar muscular conditions prevail; its seat of predilection near the inner canthus where the complexity in the arrangement of the muscle fibres affords an easy opportunity for their embryonal displacement and therefore more ready degeneration; its heredity; its usual development after middle age when degenerative processes are apt to occur; the peculiar yellow pigment which is, however, always present in muscles undergoing fatty degeneration, etc.

Discussion: Dr. GRUENING said that clinically the picture bears out Dr. Pollitzer's pathology; he had seen the condition apparently follow along the orbicularis fibres. With regard to treatment his operations had not all been successful, as in some cases after excision the condition had returned.

Dr. KNAPP said that in most cases where he had removed the xanthoma thoroughly, it had not returned.

Dr. WEEKS said that his experience had been like that of Dr. Knapp.

Dr. W. A. HOLDEN read a paper, entitled **"Remarks on Pneumococcus Infection of the Conjunctiva and Cornea,"** with demonstration of specimens. (Published in this number of the ARCHIVES.)

Dr. KNAPP moved that discussion of Dr. Holden's paper be postponed till the next meeting. Carried.

Dr. W. H. BATES read a paper, entitled **"Suture of the Cornea after Removal of the Lens:** an Experimental Study." (Published in this number of the ARCHIVES.)

DR. C. H. WILLIAMS, of Boston, said that it seems rational where a cut is made, to close it. In one case of his father's the suture was left in 40 days, and there was no irritation. His father used to make the Le Brun corneal section. If you have a conjunctival flap, a number of sutures, three or four, can be inserted and can secure a prompt closing of the wound. There is prompt healing of the conjunctiva, and thus the cornea is better nourished and assisted in healing. However, the use of corneal sutures is not a routine method of treatment with him-

self. Where there is prolapse of the iris or vitreous, or where the patient is asthmatic, it can be well used.

Also discussed by Dr. A. V. DEYNARD.

In Executive Session. Dr. Weeks moved that a committee be appointed to confer in regard to the matter of the publication of the Transactions. The Chairman appointed Dr. Marple, Chairman of the Committee, which should consist of said Chairman and Drs. Knapp and Weeks.

Adjourned,

W. B. MARPLE, Secretary.

BOOK NOTICES AND REVIEWS.

I.—**Diseases of the Eye.** By EDWARD NETTLESHIP. Revised and edited by W. T. HOLMES SPICER. Fifth American from the sixth English edition, with a supplement on color-blindness, by W. THOMSON. Handsome 12mo, of 521 pages, with 2 colored plates and 161 engravings. Cloth, $2.25. Lea Bros., Philadelphia and New York, 1897.

We are very glad Mr. Holmes Spicer brought out a new up-to-date edition of Nettleship's excellent treatise. The student and general practitioner could not find a better guide to acquaint themselves with all that is essential in practical ophthalmology, in which they will be efficiently aided by the numerous very clear and neat drawings. With all its conciseness and practical character, the author never forgets to support his statements, descriptions, and advice by scientific reasons, making constant excursions into the domains of optics, pathology, and matured clinical experience. What we find most commendable in this text-book are the simplicity of the language, the precision in the presentation of the fundamental facts, the abundance of detail, and the harmonious arrangement of the whole, all parts of which are instructive, none tedious. H. K.

II.—**Practical Handbook of the Diseases of the Eye.** By D. CHALMERS WATSON, Edinburgh. 16mo, of 236 pages, with 9 colored plates and 24 text-illustrations. New York: The Macmillan Comp.; Edinburgh: W. F. Clay, 1897. Price, $1.60.

The young author presents the essentials of ophthalmic surgery chiefly according to the teaching and with the help of his teachers Argyll-Robertson and G. A. Berry, in the manner of a *Vade-mecum* for the clinic and lecture-room, and as a "*quiz-compend*" for recitations and to prepare for examination. It is a very practical, well gotten-up, and comprehensively arranged little book. The

symptoms of disease are well outlined, and the treatment, both local and general, given in detail. As a book of reference, even for the general practitioner, it is too short, as a guide for the student, very commendable. H. K.

III.—**The Ophthalmoscope.** A Manual for Students. By GUSTAVUS HARTRIDGE, London. A very neat 12mo volume of 159 pages, with 68 illustrations and 4 plates. Third edition. Philadelphia: P. Blakiston, Son, & Co., 1012 Walnut Street, 1897.

Among the numerous guide-books of ophthalmoscopy, this is one of the neatest and clearest. It comprehends an optical introduction, reproduced from the author's popular treatise on *The Refraction of the Eye*, the description of the ophthalmoscope, and the methods of examination, including focal illumination and retinoscopy. These subjects occupy eighty pages. The remainder is devoted to the normal appearances of the fundus; the cornea, anterior chamber, iris, and lens; the vitreous; the choroid; the retina; the optic nerve. An appendix of three pages recapitulates the plan of examination recommended.

The book contains nothing that is not found in the medium-sized and larger text-books of ophthalmology, but distinguishes itself by an elementary and very clear presentation of the subject, on account of which it can be recommended, not only as a companion in courses of physical examination, but also to the student who wants to acquire the art of ophthalmoscopy without a teacher. H. K.

IV.—**The Eye as an Aid in General Diagnosis.** A Hand-Book for the Use of Students and Practitioners. By E. H. LINNELL, Norwich, Ct. Philadelphia: The Edwards & Docker Co., 1897.

This neatly gotten-up 8vo of 248 pages, with some illustrations, is a very useful and interesting collection of many facts taken "from the writer's personal experience and extensive reading." The book shows a fair amount of genuine observation, reflecting particularly the author's familiarity with the views of American ophthalmologists. The subject-matter is divided into three parts:

I. The Eye Symptoms of Nervous and Constitutional Diseases.

II. Reflex Neuroses.

III. Secular Affections of Toxic Origin. The book will be easily understood and read with interest and profit by the tyro as well as by the adept. H. K.

V.—**Die Erkrankungen des Auges im Zusammenhang mit anderen Krankheiten.** Prof. SCHMIDT-RIMPLER, Göttingen. Wien, 1898. Price, 13 M. ($3.25).

This large 8vo volume of 566 pages is the twenty-first volume of the extensive cyclopædia (in twenty-four volumes) of Special Pathology and Therapeutics of HERM. NOTHNAGEL, in Vienna. It is the most elaborate treatise on the relation of ophthalmic to general affections ever written. This relation has, of late, been a favorite subject of study, as the monographs of Förster in Gräfe-Sämisch's *Handbuch*, 1876; Berger, 1892; Knies, 1893; Gowers, 1893, and others, as well as the incident chapters in all larger text-books on ophthalmology, will testify. The work of Schmidt-Rimpler treats of eye symptoms and eye diseases manifesting themselves in the following general diseases:

I. Affections of the nervous symptoms, 293 pages.

II. Affections of the kidneys, 37 pages.

III. Constitutional anomalies, 85 pages.

IV. Affections of the circulatory and respiratory apparatuses, 26 pages.

V. Infectious and toxic diseases, 80 pages.

VI. Affections of the genital organs, 20 pages.

VII. Affections of the digestive organs, 16 pages.

VIII. Affections of the skin, 8 pages.

After each chapter there is an exhaustive bibliography, and at the end an index of subjects. It is impossible for us to enter into the special parts of the work; suffice it to say that nothing that has appeared thus far on this subject can approach Schmidt-Rimpler's work in comprehensiveness, methodical arrangement, and thoroughness. On going over the book we gain the impression that nothing has been forgotten. The bibliography is astounding. The whole work is attractive and of easy reading if we seek general information, and will scarcely ever disappoint us if we use it for reference. It will be a useful addition to the library of an all-round ophthalmologist and a well-informed physician. H. K.

VI.—**The Diseases and Injuries of the Conjunctiva, especially the so-called Granulated Lids.** By JOHN H. THOMPSON, M.D. Kansas City, Mo., 1897.

A small 8vo volume of 216 pages, with some illustrations, treating of the most common, and, for the practitioner, the most important subject in ophthalmology. It is written in a forcible,

positive spirit, testifying to the firmness of the author's convictions and the earnestness of his advice. Trachoma receives, as it should, the greatest attention. From a practical standpoint the reviewer shares almost all the author's views on the pathology and treatment of the conjunctiva. His views are essentially those of the Vienna school, viz., of the late Professor Arlt and his pupils, a school which, in this department, has had no rival before the very recent bacteriological era. Here and there the author's positiveness leads him to unguarded exaggerations ; for instance, on page 61, speaking of the prognosis of gonorrhœal conjunctivitis, he says: "I have never seen a case of gonorrhœal ophthalmia in which the cornea was not more or less ulcerated." Making allowance for such statements, we can only say that the book, in its easy and attractive style, deserves to be extensively read, and will amply repay the time and attention bestowed on it. H. K.

VII.—**Vade-Mecum of Ophthalmological Therapeutics.** By Dr. E. LANDOLT (Paris) and Dr. P. GYGAX (Milwaukee). Translated by Dr. E. NEYMAN (Milwaukee). Philadelphia, J. B. Lippincott Comp., 1898.

Therapeutisches Taschenbuch für Augenärzte. Von Dr. E. LANDOLT u. Dr. P. GYGAX, Übersetzt von Dr. H. LANDOLT (Strassburg). Wiesbaden, J. F. Bergmann, 1897.

This 16mo of 138, respectively 178, pages, a translation of the French original into English and German, serves a good purpose. It reviews in alphabetical order the diseases with their treatment, and the remedies with their applications. It is a very useful companion. If we want to know the treatment of the varieties and stages of a certain disease, say glaucoma, acute, chronic, hemorrhagic, etc., we find it briefly but clearly described in its essential points, and if we want to know the pharmacological properties and therapeutical uses of a certain remedy, say mercury, we find its different combinations, the dosage, formulas, and the modes of application (internal, external, hypodermic), distinctly set forth. The book is brought up to date, containing of the galaxy of modern drugs all those that have stood the test of time. As to the views of the authors, we consider them sound throughout and there is very little where we might raise objections. We are pleased to see, for example, that they do not advocate the popular applications of stronger solutions (2 % and more) of nitrate of silver in the primary stage of blennorrhœal ophthalmia, but "as long as the swelling lasts, use iced compresses, . . . as soon as swelling and

false membranes have disappeared, cauterize with formaldehyde, 1:500 or 1:300, or with nitrate of silver, 2:100." In regard to insufficiencies and strabismus, we are not convinced of the general superiority of prorrhaphy over tenotomy. We fully recognize the value of advancement, but differ in the breadth of its indications. This special department of ophthalmic surgery, though cultivated with great zeal, is as yet far from giving general satisfaction.

These few remarks may suffice to show how large a field the therapeutic Vade-Mecum of Landolt and Gygax comprehends.

H. K.

VIII.—**Convergent Strabismus and its Treatment.** An Essay by EDWIN HOLTHOUSE, F.R.C.S. London: I. & N. Churchill. Philadelphia: P. Blakiston, Son, & Co., 1897. Price, $2.10.

This small 8vo of 177 pages is based on data which the author, while Clinical Assistant of Mr. WM. LANG, at the Royal London Ophthalmic Hospital, collected for a statistical presentation of convergent strabismus, in the same way as the subject had been treated before by Lang and Barrett, the results of which appeared in the "Reports" of the same hospital in 1888. The cases as they came up in Mr. Lang's clinic were used for this purpose. They were 144 in number; of these 142 were hyperopes with or without astigmatism, 2 only were myopes. The author considers and discusses the previous history, refraction, and vision in monolateral convergent strabismus, at the hand of many statistical tables in the same manner and spirit as this has often been done. The results agree almost everywhere with those of previous investigators, but gain value by being based on the examination of a series of successive cases. Alternating convergent strabismus was found only in 8.88 % of the whole number, and it is discussed with regard to refraction and vision, finding that there is commonly no anisometropia and that the degree of hypermetropia is usually slight; vision is mostly normal in both eyes.

The treatment of convergent strabismus, the most important chapter in the book, chiefly deals with the results of the use of spectacles, correcting the refractive error. They need not be prescribed before the patient is four years old, and have to be faithfully worn for months and years as soon as their wearing shows a diminution of the convergence. He found that with and without glasses there was a diminution of the convergence in 62 %, with glasses in 30 %, no improvement or a deterioration in 8 % of the

series under consideration. The improvement developed into a cure in 13 % of the first, and in 18 % of the second series. In the majority of his cases of alternating strabismus, glasses were of no use. According to his tables, he finds that about 70 % of those with monolateral and nearly 90 % of those with alternating squint require to be dealt with by operation in spite of previous spectacle treatment. He does not enter into the technical details of the operation. He says operations should, as a rule, not be done before the patient is at least eight years old; it would be safer not before the thirteenth year. The indications and results of surgical interference, as far as he discusses them, lack the precision which extensive personal experience alone can give.

H. K.

IX—**Über den Heilwerth der Therapie bei Trachom** (On the Curative Value of Treatment in Trachoma). By Prof. E. RAEHLMANN, in Dorpat (Russia). 72 octavo pages, with 9 text-figures and 2 plates. Berlin: Fischer, Med. Publisher, 1898.

The essay of Raehlmann is an historical and critical exposition of the management of trachoma, comprehending: 1, the medicamentous treatment; 2, the surgical treatment, and 3, the therapeutics of the complications and sequels of trachoma. The writer, supported by his extensive experience, discusses in an authoritative way the pathology and clinical features of the trachomatous process without and with therapeutical interference. His very instructive monograph will be welcome to the great number of physicians that have to deal with trachoma, this scourge which threatens to invade the new world as it has infested many parts of the old.

H. K.

X—**Über die Therapie der Conjunctivitis Granulosa** (On the Treatment of Conjunctivitis Granulosa), with particular consideration of those forms of disease which prevail in the east and west provinces of Prussia. By Dr. HERMANN KUHNT, Prof. Univ. of Königsberg. Octavo of 172 pages, with 29 text-illustrations. Reprinted from the *Klinisches Jahrbuch*, vol. vi. Jena: G. Fischer, 1897.

The spread of trachoma in the lowlands of northern Europe, adjacent to the Baltic, viz., East Russia, Poland, and the eastern provinces of Prussia, induced the Prussian "Secretary of the Interior" to commission the professor of ophthalmology in the University of Königsberg to prepare a detailed report on the occurrence, extent, danger, and treatment of trachoma. The

monograph of Kuhnt constitutes this report. It is most elaborate and devoted chiefly to the treatment of this deleterious eye disease. He dwells on the importance of proper sanitary surroundings of the patients, the cure of general diseases and other eye affections,—for instance, the lachrymal—gives a detailed description of his method of extirpating the lachrymal sac, advocates and proposes public sanitary instruction, school hygiene, and free dispensary and hospital treatment of all trachoma patients by skilled and competent oculists, in order to check the extension of the disease and reduce it to its smallest number. He discusses the medicamentous treatment by nitrate of silver, sulphate of copper, etc.; further, the mechanical methods of brossage (v. Schröder and others), expression, rubbing with strong solutions of bichloride, 1:1000, or 1:500 ; further, excision, which in the severe forms of the disease is most to be recommended. He insists, with Logetschnikoff, that the mechanical and surgical methods should always be supplemented by prolonged medicinal treatment and proper sanitary care, so as to prevent the frequent re-infections.

Kuhnt's treatise adds another to the numerous monographs on trachoma, and a very detailed and instructive one.

H. K.

XI.—**Étude sur l'Hydrophtalmie ou Glaucome Infantile.** Par EDMUND L. GROSS, M.D. (Paris and San Francisco). Paris : G. Steinheil, Rue Casimir–Delavigne, 2, 1897.

Dr. Gross publishes in a beautifully gotten-up French octavo volume of 178 pages, observations and investigations on infantile hydrophthalmus which, he made in Paris, under the auspices of Panas and Rochon-Duvigneaud. The book is an exhaustive treatise on the above very grave eye disease. By being awarded a prize it brought in to the author the proud title of *Lauréat de la Faculté de Paris.*

H. K.

Bericht über die xxvi. Versammlung der Ophthalmologischen Gesellschaft zu Heidelberg, 1897. Large-octavo of 287 pages, with 13 plates and 13 text-illustrations. Wiesbaden: Bergmann, 1898.

We notice the appearance of this excellently gotten-up volume in this place, adding that we shall publish, in our next issue, an elaborate report on the transactions of the last meeting of the oldest and most flourishing ophthalmological society.

H. K.

XII.—**Die Augenärztlichen Operationen.** Von Dr. WILHELM CZERMAK, Prof. Prague University. Wien: Carl Gerold's Sohn. 1893–1898.

Of this fundamental work we have just received the 11th and 12th numbers, pp. 685 to 812, large-8vo, with 15 original text-illustrations. It treats of the operations on the iris in the same thorough and exhaustive manner as on the operations described in the previous numbers. There is no possibility to review this great work in detail. All we want to say at present is that thus far no treatise on operations of the eye has appeared that equals Czermak's book in historic research, clearness and minute accuracy of the description of the technic of the operations, and the indications, limitations, value, and dangers of each procedure. Though there is a good deal of originality in the work, it does, in this respect, not excel the treatises of older and more experienced operators, viz., Panas and others. As a source of information, Czermak's book is unsurpassed. We may be allowed to mention the contents of the previous numbers.

No. 1 to 4 appeared 1893.

GENERAL PART.—Contains the description of the instruments used in ophthalmic surgery, with drawings in natural size. Then follow aseptic and sterlizing preparations for the operation, and various illustrations of after-treatment.

SPECIAL PART.—Operation on the lids, the conjunctiva, and the tear passages, preceded by an anatomo-physiological introduction.

The 6th and 7th numbers, 1894, are prefaced by the description of the operations on the orbit and the eyeball, with an appropriate anatomical description of the orbit and its accessory cavities.

The 8th and 9th numbers, operations on the muscles and the eyeball, are preceded by a rather lengthy exposition of the physiology of the ocular muscles, with the illustration and description of a cumbersome apparatus. The last part is devoted to a very thorough general introduction to operations on the eyeball, which contains a good deal of excellent advice, though it is not free from tediousness; for instance, the illustrations on page 552, etc., remind one of the antiquated elaborate geometrical drawings illustrating the methods and technic of couching the lens.

The 10th number, 1896, contains the operations on the cornea and sclera.

XIII.—**Maladies de l'Œil,** par ALBERT TERSON, being the first

part of the fifth volume of the *Traité de Chirurgie Clinique et Opératoire*, par Le Dentu et P. Delbet, pp. 324. Publishers: J. B. Baillière et Fils, 19 Rue Hautefeuille, Paris.

Dr. Terson has succeeded in giving in an excellent and brief form so much of ophthalmology as is essential to the medical practitioner; at the same time his little book will be read with great profit by the ophthalmologist. The subject matter is brought thoroughly up to date. The corneal and conjunctival affections are treated with due regard to the advances in bacteriology which have been made in recent years. In the diseases of the deeper tunics of the eye, the role of autogenous and endogenous infections is emphasized. The surgical part of the subject is especially well presented. Dr. Terson's long association with Professor Panas in the eye-clinic of the Hôtel Dieu has particularly fitted the author to write the ophthalmological part of an exhaustive work on general surgery in an eminently practical and scientific manner. A. H. K.

XIV.—**Optique Physiologique,** par le Dr. TSCHERNING, Directeur-adjoint du Laboratoire d'Ophtalmologie de la Sorbonne. A royal 8vo volume of 338 pages and 201 figures. Price, 12 francs. Publishers: Georges Carré et C. Naud, 3 Rue Racine, Paris.

The appearance of a new work on physiological optics will be extremely welcome to all interested in the physiology of sight. It is the first time that this subject has been presented in a manner which, on the reader's part, requires only a moderate acquaintance with mathematics. Helmholtz's classical work has been inaccessible to the majority, owing to the considerable knowledge of mathematics taken for granted. The subjects are treated under the following headings: Dioptrics, Functions of the Retina, Movements of the Eyeball, and Binocular Vision. Dr. Tscherning's name is best known in connection with the annotated translation of the works of Thomas Young and with many of the questions under the first subdivision, *i. e.*, the Dioptrics of the Eye, where he has made many original investigations. His theory of accommodation, which has aroused considerable interest on many sides, is fully described. The subjects are treated in a remarkably lucid manner; due attention is paid to the practical bearings of all scientific questions. The book will be of great value to all who desire to become as conversant with the science as with the art of ophthalmology. The typography and illustrations are unexcelled. A. H. K.

MISCELLANEOUS NOTES.

AMERICAN MEDICAL ASSOCIATION—President, GEO. M. STERNBERG, Washington, D. C. Place of meeting, Denver, Col., June 7–10, 1898. Section of Ophthalmology: President, HAROLD GIFFORD, Omaha, Neb.; Secretary, ROBERT L. RANDOLPH, Baltimore, Md.

The annual meeting of the GERMAN OPHTHALMOLOGICAL SOCIETY will be held at Heidelberg, August 4–6, 1898.

SOCIÉTÉ FRANÇAISE D'OPHTALMOLOGIE—Next meeting, Monday, May 2d, at 8.30 A.M., à l'Hôtel des Sociétés savantes, opposite the École de Médecine, Paris. Subject for discussion: "On the Intraocular Hemorrhages of Young People," introduced by Dr. ABADIE, of Paris. General Secretary, DUBOIS DE LA VIGERIE, 56 Rue de la Victorie, Paris.

Dr. FRANK C. TODD has been appointed to succeed Dr. Frank Allport (resigned, now practising in Chicago), as Clinical Professor of Ophthalmology and Otology in the University of Minnesota.

Dr. R. GREEFF, of Berlin, and Dr. E. von HIPPEL, of Heidelberg, have received the title of extraordinary professor.

Dr. BELLARMINOFF, of St. Petersburg, has been appointed ordinary professor of ophthalmology.

Dr. R. H. TAYLOR, lecturer on ophthalmology at the Medical School of Liverpool, is dead.

Contents of the last number of the Archiv für Augenheilkunde (German Edition of these ARCHIVES).

Vol. XXXVI., No. 3. Issued March, 1898.

17. PROFESSOR ULRICH. On the permeability of the iris and the lens-capsule to fluids.

18. DR. LIEBRECHT. Investigations on the adaptation of the entire retina in diseased eyes.

19. J. WOLFF. Paralysis of the associated lateral movements of the eyes, etc. (appears in this number).

20. DR. GUILLERY. Accommodation and visual field.

Systematic Report of the 3d quarter of 1897 in this number.

edies, and instruments, and to discuss in a progressive, yet conservative spirit all questions of present importance.

The ARCHIVES contain exclusively original papers on all branches of Ophthalmic and Aural Surgery, and original reports on the progress of Ophthalmology and Otology throughout the world. The original papers occupy about three-fourths of the space, and their scope embraces all subjects of scientific and practical interest in the departments of Ophthalmology and Otology.

Special attention is paid to the preparation of the Reports on the Progress of Ophthalmology and Otology. These Reports are intended to furnish *complete, systematic, and early reviews* of the current Ophthalmological and Otological literature of the world, and the work of preparing them is divided among a specially selected number of collaborators.

Under the heading of "Miscellaneous Notes" there will be published all kinds of professional news that concerns the Oculist and Aurist, *e.g.*, appointments, honors, resignations and vacancies, new ophthalmic and aural hospitals, prize questions and essays, announcements of Society meetings, etc.

Each volume contains besides a specified table of contents, an index of subjects and authors, both of the original papers and the reports, and a general index of the preceding seven years is added to every seventh volume.

Original papers of value from any source are solicited.

Communications for the English edition of the ARCHIVES OF OPHTHALMOLOGY should be addressed to DR. H. KNAPP, 26 West 40th Street, New York, those for the ARCHIVES OF OTOLOGY either to DR. H. KNAPP, or to DR. U. PRITCHARD, 26 Wimpole Street, W., London, England.

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EDITORIAL NOTE.

In asking for continued support of the ARCHIVES from subscribers and contributors, the Editors offer no new program, but point to the record of the work that has been accomplished during the past twenty-eight years. At the first appearance of the ARCHIVES in 1869, they constituted the only periodical of their class in America, and had only a few predecessors in Europe. The international character of the ARCHIVES was a novel and distinctive feature.

The original program of the ARCHIVES to publish only original papers in semi-annual independent numbers has, in the course of years, been extended by the addition of reviews of the current ophthalmological and otological literature.

With the eighth volume, in 1879, the combined ARCHIVES, issued semi-annually, were divided into two separate journals, issued quarterly, and each of about the same size as the combined journal, and the reviews were converted into quarterly reports, systematic and comprehensive, though concise, on the progress of ophthalmology and otology.

Since that date, the ARCHIVES have developed into an extensive and conveniently arranged storehouse of knowledge for the instruction of the student and for reference by the practitioner and the investigator.

For more than ten years, the valuable material offered to the ARCHIVES has been so abundant that it has not been practicable to utilize for the English edition the full series of papers from the German, or the converse. Many articles had to be abridged, while of others abstracts only could be printed. Any one of our readers could, however, have secured, and can secure in future, from the American editor, or the German publisher, the loan of the original papers presenting the complete text.

It is the purpose of the editors to arrange, in the department of Reports, for the review of every publication which in their opinion contains material that can be called distinctive and important. It is, of course, impossible, within the limits of the ARCHIVES or of any similar journal, to give attention to every publication in their department of science. We may state further that it is not a part of our program to furnish a complete report on the *bibliography*, but only on the **progress** of ophthalmology and otology.

Though the systematic arrangement of the reviews is of importance for reference and comprehensive information, we shall publish, as early after the meetings as practicable, reports of the proceedings of societies, always bearing in mind that the ARCHIVES are not intended to be only a repertory of knowledge, but also a journal of news.

It is natural that the English edition of the ARCHIVES should give the advantage of time and space to Anglo-American contributors over the German, and *vice versa*. It is evident, however, that the association of the two editions lends strength to each, furnishing to the authors a wider circulation for their papers, and to the readers a larger and more diversified field of information.

ARCHIVES OF OPHTHALMOLOGY

NOTICE TO OUR READERS.

The ARCHIVES OF OPHTHALMOLOGY contain *original papers* on all branches of ophthalmic surgery, and *original reports* on the progress of ophthalmology. The original papers occupy from two thirds to three fourths of the space, and their scope embraces all subjects of scientific and practical interest connected with this department of medicine.

The object of the ARCHIVES is to guard, solidify, extend, and diffuse the stock of acquired ophthalmic knowledge by recording the constant addition of new observations, investigations, methods and means of examination, clinical experience, instruments and remedies, and further by taking part in the discussion of the questions of the day with a spirit alike conservative and progressive.

Particular attention is paid to the preparation of the Report on the Progress of Ophthalmology. The report is intended to furnish a *complete, systematic, and early* review of the current ophthalmological literature of the world. It has been necessary to divide the work of its preparation among a number of collaborators according to the following arrangement:

Dr. ST. BERNHEIMER, of Vienna.

1. *General Ophthalmological Literature:*
   - *a.*—Text-books (not abstracts, but notes pointing out what is new and characteristic).
   - *b.*—Monographs and papers on historical, statistical, and general subjects; reports on societies and hospitals.
   - *c.*—Periodicals on our specialty (short notices of their character, time and place of publication, the titles of the original papers, with the names of their authors).

2. *General Pathology, Diagnosis, and Therapeutics*, including new instruments, apparatus, and remedies.
3. *Normal Anatomy and Physiology*, including color-blindness.

Dr. C. HORSTMANN, Prof. at the University of Berlin (Potsdamer Strasse 4):

1. *Anomalies of Refraction and Accommodation.*
2. *Eyelids.*
3. *Lachrymal Apparatus.*
4. *Muscles and Nerves.*
5. *Orbit and Adjacent Cavities.*
6. *Conjunctiva, Cornea, Sclerotic.*
7. *Injuries and Foreign Bodies of these parts.*

Dr. P. SILEX, Lecturer at the University of Berlin.

1. *Uveal Tract*, including glaucoma.
2. *Refracting Media*, including the lens.
3. *Retina and Optic Nerve.*
4. *Injuries and Foreign Bodies of these parts.*
5. *Ocular affections in connection with general diseases.*

In order to obtain complete and recent reviews on the non-German ophthalmological literature, special reporters have been selected for different countries, who will send monthly abstracts of all local ophthalmological publications to Dr. C. Horstmann, of Berlin, the editor of the Report. Dr. Horstmann will distribute these abstracts among the German reporters according to the above plan, in order to preserve the systematic arrangement which we think of paramount importance.

The special reporters are:

For America: Dr. SWAN M. BURNETT, 916 Farragut Square, Washington, D. C.

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The abstracts of American ophthalmological literature formerly appeared under a special head, but are now embodied in the systematic Report. Text-books may be specially noticed.

The number of good papers offered us for publication has increased to such an extent that it is no longer possible to translate all of them unabridged. Whenever a German paper is condensed in the English version, or *vice versa*, it will be so stated. Should any one of our readers wish to recur to the original, the editors will always take pleasure in sending it for reference.

Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the ARCHIVES, and are solicited.

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